UNITED STATES OF AMERICA:
WAR DEPARTMENT.

MONTHLY WEATHER REVIEW.

(GENERAL WEATHER SERVICE OF THE UNITED STATES.)

JULY, 1888.

CONTENTS.

PREPARED UNDER THE DIRECTION OF
BRIGADIER GENERAL A. W. GREELY,
CHIEF SIGNAL OFFICER OF THE ARMY,

By H. H. C. DUNWOODY,
1ST LIEUTENANT, 4TH ARTILLERY, A. S. O. AND ASSISTANT.

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1888.

List of merchant marine steam and sailing vessels from which International Meteorological reports were received at the Office of the Chief Signal Officer, U. S. Army, Washington, D. C., in time to be used in the preparation of the Weather Review for the month of July, 1888.

	Name of vessel.	Captain.
Br.	s. s. Adriatic	Capt. J. G. Cameron.
	Ailsa	T. M. McKnight.
Am.	Alamo	S. Risk.
Br.	Alaska	Geo. S. Murray.
	Alene	E. J. Seiders.
Ger.	Albingia	R. Landerer.
	Aller	H. Christoffers.
	Allemania	N. F. Schroeder.
Br.	Alps	J. W. Tobin.
	Alvena	F. McKay.
	Alvo	D. Williams.
	Ambrose	E. Bisson.
Ger.	America	H. Heincke.
Fr.	Amerique	W. Dardinac.
Dtch.	Amsterdam	F. W. Bonjer.
Br.	Amy Dora	J. J. Thompson.
	Anchoria	W. Brown.
Am.	Andes	J. Evans.
Br.	Anerly	W. T. Sherborne.
	Arizona	S. Brooks.
	Aurania	W. H. P. Haines.
	Australia	A. McRitchie.
	Austrian	A. H. Vipond.
	Auretta	G. W. Read.
	Avon	W. H. Milner.
Nor.	Balder	F. Mohn.
Br.	Baltimore	J. Trenery.
	Barracouta	R. B. Hubbard.
	Barrowmore	John Inch.
Ger.	Baumwall	C. W. Rehse.
Br.	Bavarian	R. Leask.
Belg.	Belgenland	W. A. Beynon.
Br.	Bengore Head	J. R. Brady.
Span.	Benito Estenger	E. F. Canal.
Br.	Ben Ledi	S. Adamson.
Span.	Berrita	L. Santaulari.
Br.	Bertie	A. von Collen.
	Black Prince	J. Milburn.
Ger.	Bohemia	E. Kopff.
Br.	Borderer	F. Manley.
	Bothnia	Thomas Dutton.
	Britannic	H. Parsell.
Fr.	Britannia	J. Farazols.
Br.	British King	John Kelly.
	British Prince	S. Nowell.
	British Princess	E. H. Freeth.
	British Queen	R. Wills.
	Brooklyn City	W. Fitt.
	Buffalo	J. H. Malet.
	Bulgarian	E. Parry.
	Canada	John Robinson.
Am.	Caracas	W. M. Hopkins.
Br.	Caribbean	H. Daniel.
	Carroll	G. H. Brown.
	Caspian	A. McDougall.
	Catalonia	J. J. Atkin.
	Celtic	P. J. Irving.
	Cephalonia	Henry Walker.
	Cervin	S. Hughson.
	Chester	S. Wohlmuth.
	Circassia	A. Campbell.
Am.	City of Augusta	J. W. Catherine.
Br.	City of Berlin	F. S. Land.
	City of Chester	Robert Bond.
	City of Chicago	A. W. Lewis.
Am.	City of Dallas	C. W. Read.
Br.	City of Richmond	A. Redford.
	City of Rome	H. Young.
Am.	City of San Antonio	J. Wilder.
	City of Washington	W. M. Rittig.
Br.	Claribel	J. Clinksokel.
	Claymore	E. A. Craig.
	Colima	R. C. Jennings.
	Colon	F. Henderson.
	Colonia	W. Bocke.
Am.	Colorado	F. E. Jenikns.
Br.	Concordia	A. McLean.
	Counsellor	W. Lang.
Ger.	Cremon	J. H. Schwaner.
Br.	Cyprus	E. Guild.
	Dalton	J. Russell
	Denmark	R. S. Rigby.
	Devonia	John Craig.
	Discoverer	John Hughes.
Ger.	Donau	W. Topser.
Br.	Dorian	J. MacFarlane.
Fr.	Dupuy de Lome	S. Dechaille.
Br.	Durham City	D. D. Galbraith.
	Earnmoor	R. Grey.
Dtch.	Edam	H. C. v. d. Zee.
Br.	Edith Godden	J. H. Bennett.
	Egypt	J. Sumner.
	Egyptain Monarch	J. W. Bristow.
Ger.	Eider	H. Baur.
	Elbe	G. Meyer.
Am.	El Paso	H. S. Quick.
Span.	Emiliano	J. de Bengoa.
Ger.	Ems	Th. Jüngst.
Br.	England	A. F. Heeley.
	Erin	Wm. Tyson.
	Ethiopia	John Wilson.
	Etruria	T. Cook.
	Explorer	E. A. Brown.
Nor.	Faedrelandet	A. C. Brunn.
Br.	France	A. D. Hadley.
Ger.	Fulda	R. Ringk.
Br.	Furnessia	J. Hedderwick.
	Galileo	Wm. Magee.
	Gallia	M. Murphy.
Dan.	Geiser	C. W. Möller.
Ger.	Gellert	W. Kuhlewein.
	Germanic	E. Gleadell.
	Glendale	W. Dickman.
Br.	s. s. Gothenburg City	
	Gothia	Capt. G. Franck.
	Grecian	C. E. LeGallais.
	Greece	A. J. Jeffrey.
Span.	Guido	J. Echevarria.
Br.	Gussie	Robert Staples.
Ger.	Gwent	J. Lund.
Dan.	Hekla	A. G. Thomsen.
Br.	Helvetia	G. Cochran.
Ger.	Hermann	A. Kohlman.
Nor.	Hertha	M. C. Nygaard.
Br.	Hibernian	John Brown.
	Holland	Thos. Foote.
	Hondo	J. Brownrigg.
Ger.	Holsatia	C. Droescher.
Br.	Hudson	H. R. Freeman.
Am.	Indiana	W. J. Boggs.
Br.	Inventor	Wm. Jones.
	Iowa	E. W. Owens.
Dan.	Island	W. Skjodt.
Br.	Istrian	T. H. Fox.
	Italia	Thos. Craig.
	Italy	W. Pearce.
	James Turpie	Wm. Smith.
Belg.	Jan Breydel	S. Smit.
Br.	Kansas	W. Gleig.
	Kepler	M. Fleet.
Fr.	Kleber	de Robiano
	La Bourgogne	E. Frangeul.
	La Bretagne	M. de'Jousselin.
	La Gascogne	Santelli.
Ger.	Lahn	H. Hellmers.
Br.	Lake Huron	M. L. Tranmar.
	Lake Superior	Wm. Stewart.
	Lake Winnipeg	P. D. Murray.
Am.	Lampasas	M. B. Crowell.
Fr.	La Normandie	G. Kersabiec.
Dtch.	Leerdam	G. Stenger.
Br.	Lord Clive	P. Urquhart.
	Lord Gough	E. M. Hughes.
	Lord O'Neill	A. Ferris.
Am.	Lorenzo D. Baker	Warren F. Wiley.
	Louisiana	E. V. Gager.
Br.	Ludgate Hill	Jas. Brown.
	Lydian Monarch	T. C. Huggett.
Ger.	Main	J. Schunmann.
Am.	Manhattan	Frank Stevens.
Br.	Manitoban	J. Amburg.
	Maranhense	F. B. Tregarthen.
Ger.	Marsala	N. Mhas.
Br.	Mentmore	B. Boucher.
	Michigan	
	Michigan	
	Minnesota	B. J. Blacklin.
Ger.	Moravia	Kopff.
Br.	Muriel	G. S. Locke.
	Nasmyth	Thos. T. Farrell.
Belg.	Nederland	A. J. Griffin.
Am.	Nueces	Jas. Bolger.
Fr.	Neustria	P. Verriers.
Br.	Nestorian	John France.
	Nevada	J. A. B. Cushing.
Am.	Newport	W. G. Shackford.
Belg.	Noordland	H. E. Nickels.
Nor.	Norrona	J. J. Isakjen.
Br.	Norseman	D. Morris.
	Nova Scotian	R. H. Hughes.
	Ohio	R. W. Sargent.
Dtch.	Oranje Nassau	J. A. J. La Crooy.
Br.	Oregon	H. C. Williams.
	Orinoco	J. S. Garvin.
	Parisian	W. H. Smith.
	Pavonia	A. McKay.
Dtch.	P. Caland	A. Potjer.
Br.	Peconic	G. Evans.
	Persian Monarch	Irwin.
Am.	Philadelphia	Sam. Hess.
Br.	Phoenician	D. J. James.
Ger.	Polynesia	A. Kuhn.
Br.	Pomeranean	H. Dalziel.
	Pomona	J. Legoe.
	Ponca	W. Bowen.
	Pontiac	H. W. Brown.
	Powhatan	John Jenkins.
Dtch.	Prins Wilhelm	H. N. Prins.
Br.	Queen	T. Aunison.
	Republic	H. Davison.
Ger.	Rhaetia	H. Vogelgesang.
	Rhein	W. Kuhlmann.
Belg.	Rhynland	J. C. Jamison.
Br.	Robina	T. H. Smith.
	Roman	E. Maddox.
Dtch.	Rotterdam	G. Bakker.
Ger.	Rugia	R. Karlowa.
	Saale	H. Richter.
Br.	Saint Ronans	H. Campbell.
	Samana	H. Bermpohl.
	Samaria	J. B. Watt.
	Santiago	J. B. Allen.
	Sarmatian	W. Richardson.
	Sarnia	J. Gibson.
Ger.	Saxonia	F. Reuter.
Br.	Scandinavian	John Park.
	Scythia	T. Roberts.
	Serapis	Geo. Dobson.
Span.	Serra	F. de Luzarraga.
Br.	Servia	M. McKay.
	Siberian	R. P. Moore.
	Sidonian	B. Jamison.
	Sorrento	F. W. Ouston.
	Spain	W. A. Griffiths.
	State of Georgia	G. Moodie.
	State of Indiana	A. Ritchie.
Br.	s. s. State of Nebraska	Capt. A. G. Braes.
	State of Nevada	J. A. Stewart.
	State of Pennsylvania	A. J. A. Mann.
	State of Texas	Gilbert William
	Strathleven	C. W. Pearson.
	Stockholm City	W. Thompson.
Ger.	Suevia	C. Ludwig.
Fr.	Sully	A. Voisin.
Belg.	Switzerland	J. Ueberweg.
Br.	Suez	
	The Queen	T. P. Heeley.
Dan.	Thingvalla	S. T. H. Laub.
Ger.	Thuringia	G. Reysing.
Br.	Tofua	W. Williams.
	Toronto	Jas. McAuley.
	Tower Hill	R. Bennett.
Ger.	Trave	W. Willigerod.
Br.	Trinidad	W. J. Fraser.
	Tyrian	A. Haig.
Nor.	Viking	S. H. Fells.
Br.	Viola	L. Murray.
	Virginian	M. Fitt.
Belg.	Waesland	H. Buschmann.
Ger.	Wandrahm	T. Parath.
	Wergeland	L. W. Hansen.
	Werra	R. Bussuis.
	Weser	A. Bruns.
Belg.	Westernland	W. G. Randle.
Br.	Wetherly	J. W. Harrison.
Ger.	Wieland	A. Albers.
Br.	Wisconsin	Edward Bentley.
Ger.	Wyanoke	R. B. Boas.
Br.	Wylo	T. Rogers.
	Wyoming	C. L. Rigby.
Nor.	Ydum	D. Hagerman.
Dtch.	Zaandam	W. Paasen.
Belg.	Zeeland	C. H. Grant.
	New York Herald Weather Service.	
Br.	Athos	H. Low.
Ger.	California	O. Winkler.
Am.	City of Alexandria	John Deakin.
Am.	El Monte	J. W. Hawthorn.
Br.	Knickerbocker	F. Kemble.
	Martello	Wm. Abbott.
Ger.	Ocean	C. Schmidt
	United States Naval.	
	U. S. C. S. A. D. Bache	J. F. Moser.
	U. S. C. S. Blake	J. E. Pillsbury.
	U. S. S. Constellation	P. F. Harrington.
	U. S. R. S. Dale	Yates Sterling.
	U. S. S. Despatch	W. S. Cowles.
	U. S. S. Galena	C. M. Chester.
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	U. S. S. Jamestown	C. J. Train.
	U. S. S. Lancaster	T. F. Kane.
	U. S. S. Michigan	H. F. Picking.
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	U. S. S. Mohican	B. F. Day.
	U. S. S. New Hampshire	F. J. Higginson.
	U. S. S. Ossipee	W. B. Hoff.
	U. S. S. Portsmouth	Edwin White.
	U. S. S. Richmond	Robert Boyd.
	U. S. R. S. St. Louis	Wm. Whitehead.
	U. S. S. Saratoga	C. H. Davis.
	U. S. S. Swatara	F. W. Dickens.
	U. S. S. Yantic	O. F. Heyerman.
	Sailing vessels.	
Am.	bg. Abbie Clifford	D. W. Storer.
Am.	bk. Alice	W. G. Kair.
Ger.	sp. Annie	T. Menkens.
	schr. Anna E. Kranz	F. H. Pervere.
	schr. Annie G. O'Leary	R. Boudrow.
Swed.	bk. Arab Steed	C. A. Skantze.
Am.	Bonny Doon	Chas. Burgess.
Ger.	bk. Bremerhavn	H. Rothe.
	Chas. Luling	D. H. Watson.
Am.	bg. Daisy Boynton	C. Hardin.
Ger.	sp. Dora	H. Meyer.
Pilot	boat E. C. Knight	J. F. Springer.
Aust.	bk. Errante	A. G. Nicolich.
	Estella	W. H. Merritt.
Am.	Gelert	John Evans.
	Geo. W. Sweeny	J. F. Hewitt.
Nor.	Grundloven	O. G. Ellingsen.
Am.	Crescent	A. S. Bartlett.
Am.	bg. H. B. Hussey	G. B. Hodgdon.
Dtch.	bk. Helena	T. T. Verbeet.
Am.	bkt. Henry Warner	J. T. Paine.
	bg. Jennie Hulbert	G. R. Handy.
	bkt. Jose E. Moré	A. A. Lenhard.
	bkt. John J. Marsh	F. P. Whittier.
	bkt. Josephine	Chas. Brown.
	bk. Julia Rollins	J. J. Johnson.
	schr. J. R. Bergen	C. B. Parsons.
Am.	bkt. Levanter	Geo. F. Gerry.
	sp. Light-ship No. 43	Andrew Jackson.
	bg. L. F. Munson	J. V. McKowen.
Am.	bkt. Louise Adelaide	Edgar Orr.
Ger.	sp. Marie	L. Warnken.
Am.	bg. Mary Fink	D. B. Darrah.
	schr. Maud H. Dudley	A. L. Cummings.
	schr. Messenger	N. H. Falker.
Aus.	bk. Mattea	G. V. Vidulich.
Am.	schr. Nantasket	E. A. Richardson
	Orlando	Chas. Knoebel.
	Phœbe	M. Medert.
Ger.	bk. Pillau	G. Gerlach.
	Sapphire	
	sp. Servia	E. M. Smith.
Br.	bk. Sodium	Wm. Mensor.
Ger.	sp. Sophie	H. Hasenfuss.
Br.	bk. Valona	H. Andrews.
Am.	schr. Wm. T. Green	W. E. Crockett.

UNITED STATES SIGNAL SERVICE

MONTHLY WEATHER REVIEW.

VOL. XVI. WASHINGTON CITY, JULY, 1888. No. 7.

INTRODUCTION.

This REVIEW treats generally the meteorological conditions of the United States and Canada for July, 1888, and is based upon the reports of regular and voluntary observers of both countries. Descriptions of the storms that occurred over the north Atlantic Ocean are also given, and their approximate paths shown on chart i, on which also appears the distribution of icebergs and field-ice and the limits of fog-belts west of the fortieth meridian.

July was an unusually cool month in the upper Ohio valley and along the Atlantic coast from New England to Georgia, the greatest deficiencies in the monthly mean temperatures as compared with the normal occurring in the middle and south Atlantic states. In the Saint Lawrence Valley and over the central and northern portions of the country between the Mississippi Valley and Pacific coast the month was warmer than the average, but the departures from normal temperature were in general not marked.

The rainfall was below the average over the greater part of the country. In the Atlantic coast and east Gulf states, Ohio Valley, and middle and southern slopes it was, upon the whole, about twenty-five per cent. below the normal. In the upper Mississippi valley and on the north Pacific coast it was in excess of the average.

The remarkably heavy rains which accompanied the storms traced on chart i as numbers ii and v caused destructive freshets in the upper Ohio river and in smaller streams in adjacent states.

With this REVIEW is published a chart (vi) giving the average date of the first killing frost, as determined from data furnished by voluntary observers.

For the first time since the establishment of the Signal Service the means of all meteorological observations at stations of this service are published as determined from two observations taken at 8 a. m. and 8 p. m. The former system of tri-daily observations was on July 1, 1888, superseded by the plan of taking two observations at the hours named, and, as this latter plan has been permanently adopted, the means for Signal Service stations will hereafter be based upon but two observations.

In the preparation of this REVIEW the following data, received up to August 20, 1888, have been used, viz., the regular tri-daily weather-charts, containing data of simultaneous observations taken at 133 Signal Service stations and 20 Canadian stations, as telegraphed to this office; 178 monthly journals and 181 monthly means from the former and 20 monthly means from the latter: 360 monthly registers from voluntary observers; 59 monthly registers from United States Army post surgeons; marine records; international simultaneous observations; marine reports through the co-operation of the Hydrographic Office, United States Navy, and the "New York Herald Weather Service;" monthly weather reports from the local weather services of Alabama, Arkansas, Illinois, Indiana, Kansas, Louisiana, Michigan, Minnesota, Mississippi, Missouri, Nebraska, Nevada, New England, New Jersey, North Carolina, Ohio, Oregon, Pennsylvania, South Carolina, Tennessee, and Texas, and the Central Pacific Railway Company; trustworthy newspaper extracts, and special reports.

ATMOSPHERIC PRESSURE (expressed in inches and hundredths).

The distribution of mean atmospheric pressure for July, 1888, determined from observations taken daily at 8 a. m. and 8 p. m., is shown by isobarometric lines on chart ii. This is the first month for which a chart exhibiting the mean pressure has been based upon but two observations daily. A protracted series of hourly observations has shown that the difference between the mean pressure determined from two observations taken at the hours above named and that determined from tri-daily observations, taken at eight-hour intervals, is so very slight as to be practically inappreciable. As the plan of taking tri-daily observations at Signal Service stations was on the first of July, 1888, superseded by that of taking but two at the hours stated, chart i will in the future exhibit mean pressures determined from two daily observations.

The mean pressure for July, 1888, was greatest on the south Atlantic coast, where it was slightly above 30.05, reaching a a maximum of 30.08 at Atlanta, Ga. An isobar of 30.05 extends from northern Virginia southwestward to eastern Alabama, and thence south-southeastward to Key West, Fla. A second isobar of 30.05 is traced near the coasts of Washington Territory and Oregon; the area in this region over which the mean pressure reaches 30.05 (maximum, 30.06 at Olympia) is confined to the immediate coast of the Pacific and does not extend southward of Roseburg, Oregon. The regions of least pressure, like those of the greatest, occupy their normal positions, viz., the southern plateau and the extreme northeastern Canadian provinces, the mean pressure falling to 29.80 (at Yuma, Ariz.) in the former, and to 29.85 (at Father Point, Quebec) in the latter, making the range of mean pressure for the whole territory covered by the reporting stations .28.

As compared with the normal pressure for July, there has been a general excess over nearly the whole country, the only exceptions being the region along the Gulf coast and the extreme southwestern border from New Mexico to the Pacific coast, where the pressure was normal or slightly below. Where the pressure was above the normal the departures were less than .05 in all districts except the extreme northwest, Lake region, and middle Atlantic states, where they ranged from .05 to .08, the greatest departure occurring at Port Huron, Mich.

As compared with the previous month the mean pressure

was higher throughout the country, the excess ranging from .20 to .25 over the eastern Rocky Mountain slope and north Pacific coast; from the Atlantic coast westward to the Mississippi valley the excess ranged from .05 to .10, except on the south Atlantic coast, where it was less than .05; it was also less than .05 along the central and southern California coasts.

BAROMETRIC RANGES.

The monthly barometric ranges at the various Signal Service stations are given in the table of miscellaneous meteorological data. The ranges, as usual, conform to the general rule, that is they increase with the latitude and decrease slightly, though somewhat irregularly, with increasing longitude. Along the Atlantic coast the extreme ranges were .21 at Key West and Jupiter, Fla., and 1.15 at Eastport, Me.; between the eighty-second and ninety-second meridians, .21 at Pensacola, Fla., and .53 at Sault Ste. Marie, Mich.; between the Mississippi River and Rocky Mountains, .24 at Brownsville, Tex., and .75 at Saint Vincent, Minn.; in the plateau regions, .29 at Yuma, Ariz., and .77 at Winnemucca, Nev.; on the Pacific coast, .24 at San Diego, Cal., and .60 at Port Angeles, Wash.

AREAS OF HIGH PRESSURE.

Eight areas of high pressure were observed within, or near, the limits of the United States during the month. In general they were not clearly defined, and their movements were irregular, but the general direction was slightly to the south of east eastward of the Rocky Mountains and to the north of east on the Pacific coast. Four were first observed over the continent near, or to the west of, the Hudson Bay region; four approached from the Pacific; three crossed the Rocky Mountains near the northern boundary of the United States, all of which lost energy and practically disappeared within the United States before reaching the Atlantic. Of the four which were first observed north of the United States three were traced to the southeastward over the Atlantic.

The following table shows the approximate latitude and longitude in which the centre of each area of high pressure was first and last observed, the highest observed barometer reading attending each, and the average rate of movement in miles per hour:

Number of area.	First observed.		Last observed.		Highest observed barometer reading.	Average hourly movement.
	Lat. N.	Long. W.	Lat. N.	Long. W.		
	° ′	° ′	° ′	° ′	*Inches.*	*Miles.*
I	48 00	89 00	34 15	74 00	30.28	16.0
II	41 15	126 30	47 25	124 40	30.30	11.5
III	52 10	106 30	44 15	80 30	30.26	29.2
IV	35 35	123 30	40 25	82 25	30.40	16.2
V	51 45	98 00	43 10	59 00	30.42	12.5
VI	47 30	123 15	37 30	78 40	30.22	19.6
VII	49 30	87 30	31 15	72 30	30.34	25.8
VIII	45 00	127 15	46 30	96 40	30.22	26.7

Average rate of progress, 19.7 miles per hour.

The following are general descriptions of the weather conditions attending each high area:

I.—The month opened with a well marked area of high pressure central north of Lake Huron and covering the greater portion of the region east of the Mississippi. A second area of high pressure was apparently approaching the California coast, and cyclonic disturbances were observed in the Missouri Valley and to the east of New England. The course of this area was almost directly southward, passing over western New York during the 2d and eastern Virginia on the 3d, it being last located as central near, and to the east of, Hatteras, N. C., on the morning of the 4th. The barometric pressure within this area remained about stationary during the time it was within the limits of observation. During its transit generally fair weather prevailed over the eastern portion of the United States with temperature slightly below the normal.

II and III.—Number ii was first located as central west of northern California on the 3d, but it probably approached that location from the southwestward, and there are indications that its influence was felt on the Pacific on the 1st. It passed directly northward during the 3d, attended by increasing pressure, and on the morning of the 4th it was central near the coast line to the west of Olympia, Wash., where a maximum pressure of 30.3 was observed. It remained nearly stationary during the succeeding twenty-four hours, the barometric pressure decreasing at the centre without apparently crossing to the east of the Rocky Mountains, although it may have formed a part of high area traced as number iii, which developed north of Montana on the 6th. The last-named area of high pressure moved to the southeastward over Dakota and northern Minnesota during the 6th and 7th, attended by a slight decrease of pressure at the centre. It extended over the eastern portion of the United States during the 8th, but the barometric gradient was slight, and it disappeared by a gradual decrease of pressure during that day. It was followed in the extreme northwest by a secondary area of high pressure, which moved southward over the eastern slope of the Rocky Mountains during the 9th and 10th.

IV.—Number iv was a well-marked area of high pressure which approached the central California coast on the 11th, and on the morning of the 12th it covered the greater part of the Pacific coast, the centre being to the south of, and near, San Francisco. It moved northward, attended by general rains on the Pacific coast to the north of San Francisco and from Oregon and Washington Territory eastward to the Rocky Mountains. The barometric pressure increased with the northerly movement and a maximum pressure of 30.4 was observed at Tatoosh Island, Wash., on the morning of the 15th. After this date the southeasterly movement was observed, and it passed slowly over the Rocky Mountains during the 16th and 17th, and was central near Cheyenne, Wyo., on the 18th. Numerous heavy rains were reported from the eastern slope of the Rocky Mountains and thence southeastward to the Gulf coast in the southern quadrants of the high area. It moved slowly eastward over the central valleys during the 19th and 20th, increasing largely in area and with diminishing pressure. It was last marked as central in the Ohio Valley on the 21st, when it covered the greater portion of the United States east of the Rocky Mountains. The movements of this area could not be traced further to the eastward although the pressure increased along the Atlantic coast during the 21st, and it is probable that the atmospheric conditions attending this area contributed largely to the formation of the area of high pressure to the east of New England on the 22d.

V.—This area of high pressure was central north of Manitoba on the 12th, while the high area previously described extended over the Pacific coast. Between the 12th and 15th it moved slowly southeastward over the lake region, attended by generally fair weather over the greater part of the United States east of the Mississippi River, it having been preceded by a severe storm on the New England and middle Atlantic coasts on the 12th. After reaching Lake Huron it moved eastward, crossing the Saint Lawrence Valley and northern New England on the 16th, after which the course of the centre was apparently eastward, while the barometric pressure increased along the Atlantic coast to the southward. The maximum barometric pressure observed, 30.42, occurred at Halifax, Nova Scotia, on the morning of the 18th, while the maximum pressure attending this area in the lake region was 30.24.

VI.—This area of high pressure was observed on the north Pacific coast on the afternoon of the 20th. It crossed the Rocky Mountains near the northern boundary on the 21st, attaining a maximum pressure of 30.22 in Montana. It could scarcely be defined while passing over the upper Missouri valley, where it remained almost stationary from the 21st to 24th, after which it extended over the central valleys and moved slowly southeastward bounded by an isobar of 30.1, which included the greater portion of the area east of the Mississippi. Its movements could not be traced to the eastward of Virginia after the 26th.

VII.—Number vii appeared to the north of Lake Superior

on the 26th and moved slowly to the southeastward, the centre being near Lake Huron on the afternoon of the 27th. The reports indicate that this was only a part of an extended high area, the centre of which was over the Gulf of Saint Lawrence on the morning of the 28th, where it remained nearly stationary during the succeeding twenty-four hours, after which the area of greatest barometric pressure was transferred to the middle Atlantic coast, where it remained with a gradual movement to the southward until the close of the month.

VIII.—Number viii approached from the Pacific, and was central near the mouth of the Columbia River on the morning of the 29th. On the 30th it crossed the Rocky Mountains over Montana, where the maximum pressure of 30.22 was observed. It followed the course of the Missouri River on the 30th, extending over the extreme Northwest, where it remained at the close of the month, but the barometric pressure had decreased within its limits to less than 30.1.

AREAS OF LOW PRESSURE.

On chart i will be found the approximate tracks of the centres of eight areas of low pressure. For the first time the centres of these areas have been located from the two daily telegraphic observations taken at 8 a. m. and 8 p. m., respectively. The figures above the line indicate the days of the month and those below, respectively, the first and second observations of the day. It will be seen from the chart that there was almost a total absence of areas of low pressure over the greater part of the United States during the month. Only one feeble disturbance passed from the central valleys to the Atlantic coast. Four of the eight areas traced on the west and east slopes of the Rocky Mountains did not develop sufficient energy to pass east of the ninety-fifth meridian, and two disturbances, which developed north of Dakota and Montana, were traced eastward north of the Lake region, causing only slight weather changes within the United States. The severest storm of the month attended the low area which apparently approached New England from the north and afterwards changed direction to the northeast, after the centre reached the coast of Maine. Although, as a general rule, the barometric disturbances were slight, numerous local storms occurred during the month, causing some damage to crops in the central Mississippi valley, especially to oats.

The following table shows the latitude and longitude in which each area of low pressure was first and last observed, the lowest pressure observed within each area, and the average velocity in miles per hour:

Number of area.	First observed.		Last observed.		Lowest observed barometer reading.	Average hourly velocity.
	Lat. N.	Long. W.	Lat. N.	Long. W.		
	° ′	° ′	° ′	° ′	*Inches.*	*Miles.*
I	44 50	100 00	51 50	94 45	29.42	16.7
II	40 00	94 00	37 30	75 30	29.82	30.6
III	51 30	110 40	46 30	98 00	29.34	33.3
IV	48 30	73 50	49 30	64 10	28.94	19.8
V	51 40	96 00	50 15	69 45	29.64	18.1
VI	35 30	116 00	43 40	103 15	29.62	27.8
VII	52 15	109 00	50 25	64 45	29.50	43.8
VIII	40 30	117 15	45 00	116 45	29.68	16.7

Average rate of progress, 25.8 miles per hour.

I.—On the 1st of the month this area of low pressure was central in the Missouri Valley near Fort Sully, Dak., while the pressure was relatively high over the lakes and on the north Pacific coast. It moved southward during the first twelve hours, after which it apparently moved directly north and formed a part of an extended depression which passed to the north of Manitoba on the 3d. A slight secondary disturbance appeared over Colorado, which was rapidly filled up by the area of high pressure on the Pacific coast. Numerous local storms occurred in the upper Mississippi valley and Lake region on the 3d, after this disturbance had passed beyond the limits of observation and was apparently moving eastward north of the lakes. The depression which appeared in the lower Saint Lawrence valley on the 4th, although not traced as a part of low area i, may have been a continuation of this storm. The latter apparently approached from the Hudson Bay region and developed considerable energy on the night of the 4th and during the 5th in the northern portion of the middle Atlantic states and New England. Numerous thunder storms, accompanied by high winds and heavy rains, occurred in these regions during the 5th.

II.—Number ii was a slight depression of extended area apparently central in the lower Missouri valley on the afternoon of the 8th. It moved slowly eastward attended by general rains over the central valleys and Southern States during the 9th, and on the Atlantic coast from Florida to Rhode Island on the 10th. It was last observed as central near Cape Henry, Va., on the morning of the 10th.

III.—Number iii developed in the extreme northern portion of a barometric trough which extended over the plateau region on the 9th. It was first located as central north of Montana on the afternoon of the 10th, and it moved slowly southeastward over the upper Missouri valley, and was apparently forced to the westward and filled up by the advance of an area of high pressure which followed the severe storm on the Atlantic coast, traced as number iv. The pressure increased at the centre during the southeasterly movement, and it disappeared without causing any marked disturbance, although between the 12th and 16th several minor depressions developed in the Rocky Mountain region, causing severe local storms on the eastern slope, but they generally did not continue more than twenty-four hours and are not traced as separate disturbances.

IV.—The telegraphic reports of the 10th indicated the presence of three depressions north of the stations of observation distributed along the fiftieth parallel, between the Gulf of Saint Lawrence and the Rocky Mountains. The disturbance north of the Lake region apparently united with the one to the eastward on the 11th and moved southward to the vicinity of Montreal, where it was central on the afternoon of the 11th. The pressure diminished .4 of an inch in twelve hours near the centre of disturbance, and dangerous gales occurred on the lower lakes and Lake Huron while the disturbance was passing southeastward from the Saint Lawrence Valley to the New England coast. The pressure decreased during the southeasterly movement and also during the northerly movement after the change of direction near Eastport, Me., until the minimum of 28.94 was reached at Anticosti on the 13th. The precipitation was heavy near the centre of disturbance, and the velocity of the wind ranged from thirty to forty-five miles per hour on the New England coast. At Mount Washington, N. H., more than three inches of precipitation occurred, a part of which was in the form of snow. The observer at Mount Washington reports as follows:

Reduced barometer at 12 m., 12th, was 28.98 and the storm raged with great fury the whole day; during night rain changed to snow, the temperature falling to 24° during the early morning; snow continued to 10.12 a. m. when it changed to rain, continuing the remainder of the day; at 1 p. m. wind attained a maximum velocity of one hundred and twenty miles per hour; the wind blew at an average rate of about ninety miles per hour for nearly nine consecutive hours; temperature began rising about 5 a. m. and barometer at 1 p. m.. The floors of station building were flooded by the rain; unmelted snow, four inches.

V.—Number v appeared north of Manitoba on the 17th and during the succeeding twenty-four hours moved southeastward, reaching the northern portion of Lake Superior on the morning of the 18th. The course changed to the eastward, and, after remaining nearly stationary for twelve hours in the vicinity of Lake Huron passed down the Saint Lawrence Valley, disappearing to the northeastward during the 20th. It apparently developed its maximum energy while passing to the north of Lake Huron. The rain area attending this disturbance included the greater part of the United States east of the Mississippi, but in the Southern States the precipitation generally occurred locally in advance of the high area to the westward.

VI.—Number vi was a depression which developed over the southern plateau region on the 28th, and, after reaching the

central Rocky Mountain region on the succeeding day, it was forced southward by an area of high pressure from the north and disappeared by a gradual increase of pressure.

VII.—Number vii was central far to the north of Montana on the 29th. It was the most northerly depression traced during the month, and its course eastward is only approximately determined by stations which were in its southern quadrants. General rains occurred along the northern boundary and as far southward as the Lake region during its passage eastward on the 30th and 31st, and brisk to high winds occurred in the Lake region. It was central over the Gulf of Saint Lawrence at the close of the month.

VIII.—On the 30th the barometer was low over the plateau regions, and this disturbance was apparently moving slowly northward from Nevada towards Washington Territory, where it remained nearly stationary on the 31st, but as an extended barometric trough, covering the entire plateau region from Arizona to the northern boundary of the United States.

NORTH ATLANTIC STORMS FOR JULY, 1888.

[*Pressure in inches and millimetres; wind-force by Beaufort scale.*]

The paths of the depressions that appeared over the north Atlantic Ocean during July, 1888, have been determined from international simultaneous observations by captains of ocean steamships and sailing vessels, received through the co-operation of the Hydrographic Office, Navy Department, and the "New York Herald Weather Service."

Eight depressions have been traced, of which five advanced eastward from the American coast north of the fortieth parallel; two first appeared over mid-ocean north of the fiftieth parallel, and one apparently developed off the eastern edge of the Banks of Newfoundland. The depressions generally pursued normal east to east-northeast tracks, except over and near Newfoundland, where they moved northeastward. Two storms are given probable paths from Newfoundland to the British Isles. From the 1st to the 5th a depression of moderate energy pursued an irregular path south of Nova Scotia and Newfoundland, and a depression of marked strength advanced from mid-ocean in about thirty-five degrees west longitude to the British Isles attended by fresh to whole gales. From the 6th to the 10th the barometer continued high over mid-ocean; to the westward of the forty-fifth meridian moderate gales were occasioned by the passage of a depression northeastward over Newfoundland; in the vicinity of the British Isles the weather was generally unsettled with moderate to fresh north to west gales and slowly rising barometer. From the 12th to the 16th, inclusive, a depression of considerable strength traversed the ocean from Nova Scotia to the British Isles. From the 17th to the 20th the pressure continued low with moderate to fresh gales over and west of the British Isles, while over the western portion of the ocean the barometer was high. Subsequent to the 20th the barometric fluctuations were frequent and marked over the entire ocean during the passage of three depressions of average summer strength, one of which is traced from the Gulf of Saint Lawrence to the northward of the fiftieth parallel and thence south of east to the British Isles from the 25th to the 29th, inclusive; a second advanced from east of Newfoundland to the British Isles from the 25th to the 28th, and a third developed southeast of Nova Scotia on the 29th and from thence passed northward over Newfoundland during the 30th.

In July, 1887, seven depressions were traced, of which two passed eastward over the northern extremity of Newfoundland and advanced to the northward of the British Isles; two moved eastward from the coast of the United States south of the forty-fifth parallel, and three first appeared over mid-ocean. The general course of direction of the depressions was east-northeast, and their rate of progression was, as a rule, slow. Barometric pressure falling below 29.00 (736.6) was reported on the 8th over mid-ocean, and on the 26th to the southward of Iceland. In July, 1888, the depressions that appeared over the north Atlantic, while being somewhat deficient in number when compared with those traced for corresponding months of previous years, were of average summer strength. A noteworthy feature of the month was the entire absence of important disturbances in the vicinity of the West Indies and over the Gulf of Mexico; it is also observable that the paths of the storms that passed eastward from the American continent were confined to unusually high latitudes.

In the following descriptions of the depressions traced, positions are given in degrees, latitude and longitude, except in cases where twenty-five to thirty-five minutes are cited, when they are shown in degrees and half degrees:

1.—This depression was central on the 1st south of the western extremity of Nova Scotia, where the barometric pressure fell below 29.70 (754.4). During the next four days the storm-centre pursued an irregular path west of the fiftieth meridian, after which it apparently moved northwestward under the influence of depression number 3, which was central on the 6th over the Gulf of Saint Lawrence.

2.—This depression was a continuation of depression number 9 traced for June, 1888, and was attended over mid-ocean by the severest disturbances of the month. On the 1st the storm was central in about N. 52°, W. 35°, with pressure falling below 29.20 (741.7) and fresh to strong gales from the forty-fifth meridian to the European coast. Moving slowly northeast to the fifty-fifth parallel by the 2d the depression is thence traced east and east-southeast over the British Isles by the 8th; subsequent to the 1st a gradual increase in pressure and a corresponding diminution of energy were observable.

3.—This depression advanced eastward over the Gulf of Saint Lawrence during the 6th and 7th, accompanied by fresh to strong gales to the thirty-fifth parallel; by the morning of the 8th the storm-centre had moved northeast over Newfoundland, and, after the 9th, disappeared in the direction of Greenland, its northerly course being apparently due to the presence over mid-ocean of an area of high barometric pressure.

4.—This depression was central on the 12th off the western extremity of Nova Scotia, where pressure ranging below 29.20 (741.7) was reported. From this position the storm advanced in a generally east-northeast course to the twenty-fifth meridian, and thence moved south of east over the British Isles by the 16th. While this storm was accompanied throughout by low barometric pressure and gales of marked strength, its northerly track prevented the disturbances by which it was attended from being severely felt over a considerable portion of the trans-Atlantic tracks.

5.—This depression was first located in about N. 53°, W. 20°, on the 21st, from whence it moved slowly eastward to the thirteenth meridian by the 22d, after which it passed northeastward over the British Isles, its course being attended by pressure falling to about 29.30 (744.2) and moderate to fresh gales.

6.—This depression passed eastward over Newfoundland during the 25th, and, pursuing a normal east-northeast course, reached the British Isles by the 30th. While this storm was unattended by unusually low barometric pressure or heavy gales, the following report from Mr. Jno. Higgins, observer at Saint John's, N. F., indicates the severe character of the electrical disturbances which accompanied its passage over Newfoundland: "A thunder-storm passed over Pools Island, Bonavista Bay, on the evening of the 25th which exceeded in severity any storm of this description heretofore reported from that locality. The lightning was vivid and did much damage. At Saint John's the lightning was blinding in its vividness and close to the earth, accompanied by heavy rain and thunder. It appeared to travel from west to east."

7.—This depression first appeared in N. 47°, W. 40°, on the 25th, with central pressure about 29.50 (749.3), whence it moved eastward to the twenty-fifth meridian by the 26th, and thence east-northeast to the southwestward of Ireland by the 27th; by the 28th the storm-centre had passed northeast over Ireland, after which it apparently recurved westward under the influence of depression number 6, which was central on the 29th to the westward of the British Isles.

8.—This depression is first located southeast of Nova Scotia under date of the 29th, when central pressure about 29.70 (754.4) and fresh to strong gales were reported west of the fiftieth meridian. By the 30th the storm-centre had moved northward to the south coast of Newfoundland, after which it apparently advanced north-northeast and disappeared north of the region of observation.

FOG.

The following are the limits of fog-areas on the north Atlantic Ocean during July, 1888, as reported by shipmasters:

Date.	Vessel.	Entered.			Cleared.		
		Lat. N.	Lon. W.	Time.	Lat. N.	Lon. W.	Time.
		° ′	° ′		° ′	° ′	
1	S. S. Elbe	40 20	67 43		40 22	66 55	
1	Norseman	43 30	49 00	2 a. m	42 54	52 35	11.30 a. m.
2	Sarnia	52 45	51 49	6 p. m	52 36	51 11	9 p. m.
3	Italy	41 07	46 43	2.50 a. m.	41 14	45 11	9.30 a. m.
4	Aller	43 08	48 01	2.30 a. m.	42 29	52 01	1 p. m.
5	British Queen	42 55	58 36	4 a. m	42 53	59 20	7 a. m.
5	Main	44 53	43 26	2.54 p. m.	42 50	48 30	11.50 a. m.
6	Buffalo	43 51	42 55	6.30 a. m.	44 06	42 18	9 a. m.
6-7	Robina	36 15	75 05	8.10 p. m.	37 00	75 03	7.20 a. m.
6	Colina	52 13	53 50	11.30 a. m.	52 05	54 23	1 p. m.
6	La Normandie	42 40	47 49	2 a. m	42 22	48 55	6 a. m.
6-7	Lake Superior	53 26	47 38		54 52	39 12	
7	Lann	42 14	50 50	8 a. m	42 25	48 45	2 p. m.
7	Colina	50 00	39 35	11 a. m	49 30	60 30	1.30 p. m.
8-9	Scythia	46 23	40 23	noon	43 23	47 36	3.56 p. m.
8-9	Circassian	Off	Belle	Isle.			
9	Baumwall	51 45	49 00	4 a. m	51 53	51 40	11 a. m
9-10	Ludgate Hill	40 39	58 30	6 p. m	40 40	53 30	11 a. m
10-11	Germanic	43 02	54 57	10.00 p. m.	42 38	56 42	4 a. m.
10-11	Austrian	42 25	69 02	9 p. m	42 30	65 46	1 p. m.
11	Republic	43 58	46 50	10.35 a. m.	42 52	52 17	4.29 a. m.
11-12	Ludgate Hill	40 47	50 30	1 p. m	42 26	46 00	10 a. m
11-12	Italia	42 54	48 24		42 38	54 57	
11	Erin	41 10	54 00	2 p. m	41 10	55 00	6 p. m.
12	Siberian	54 00	45 00	3.55 a. m.	52 20	53 00	0.30 p. m.
12	Santiago	42 17	48 34	7 a. m	42 08	52 41	2 a. m.
12-13	Toronto	54 00	44 00	noon	52 20	52 40	4 p. m.
13	Wisconsin	45 08	44 22	noon	43 16	54 18	8 a. m.
13	Phœnician	45 01	43 51	3.50 a. m.	44 51	44 13	5.50 a. m.
13-14	Fulda	46 30	44 10	4.00 a. m.	44 50	52 25	11 a. m.
14	Belgenland	44 46	42 32	2.35 a. m.	43 50	44 42	11.35 a. m.
14-15	Phœnician	43 29	47 18	2.30 a. m.	42 16	51 01	3.24 p. m.
14	Fulda	44 46	52 55	1 p. m	43 46	56 24	12 p. m.
15	Durham City	49 30	42 36	0.30 a. m.	45 00	51 20	3 a. m.
15-16	Phœnician	42 19	51 55	8.30 p. m.	42 19	53 35	8.30 a. m.
16-17	Gothia	42 45	58 40	7 p. m	41 58	61 15	7 a. m.
16	Fulda	Nantucket Lt.		3.30 p. m.	Shinnecock.		11.30 p. m.
16	Adriatic	44 55	45 18		44 49	45 45	
16-17	Sidonian	41 04	67 36	8.30 p. m.	40 32	70 40	0.45 p. m.
17	Tern. Gelert	40 01	70 17	1.30 a. m.	40 41	70 38	Noon.
17	Pavonia	42 12	65 43	1 p. m	42 08	62 50	7 p. m.
18	Phœnician	42 29	65 30	4.20 p. m.	42 25	69 42	4.52 p. m.
18	Hondo	40 00	70 00	7 p. m	40 40	69 50	11.30 p. m.
18-19	Adriatic	41 05	63 57		40 58	64 57	
19	Saale	41 18	65 50	6.10 p. m.	41 07	66 25	8.20 p. m.
19	Pavonia	42 00	55 05	2.30 a. m.	42 00	53 40	8 a. m.
19-20	Hekla	41 30	64 20	4 a. m	40 36	71 30	9 a. m.
19	Durham City	42 45	63 00	8 a. m	42 30	69 40	12 a. m.
19	Adriatic	40 35	70 37		40 30	71 15	
19	Nova Scotian	Off	Cape	Ballard.	46 29	53 20	
19-20	Aurania	43 33	48 00	9.12 p. m.	42 30	53 00	3.32 p. m.
20	Spain	41 35	49 00	5.30 p. m.	41 34	49 25	7 p. m.
20-21	Canada	40 53	68 02	7.28 a. m.	40 32	72 38	7.10 a. m.
21	Gellert	41 57	49 07	8 p. m.	41 46	50 15	Midnight.
21-22	Nestorian	52 00	51 10	6 a. m	51 10	57 10	11 a. m.
22	Nevada	43 15	56 50	noon	42 49	59 00	8 p. m.
22-23	Istrian	44 23	47 26	10 a. m	42 35	53 39	2 p. m.
23-24	Gallia	44 15	46 35	9 a. m	42 47	57 50	5 a. m.
23-24	Gellert	41 04	64 01	midnight.	41 02	64 41	2.30 a. m.
23-24	Nova Scotian	44 17	63 49	10 p. m	41 20	66 10	6 p. m.
24	Spain	40 50	68 20	1 a. m	40 44	68 45	2.45 a. m.
24-25	Britannic	44 04	48 14	9.30 a. m.	42 40	55 37	9 a. m.
26	Cephalonia	42 00	48 50		42 05	50 30	
26-27	Manitoban	46 58	46 43	10 a. m	45 33	49 44	2 a. m.
26	La Gascogne	46 57	50 27	5 a. m	45 44	53 18	1 p. m.
27	Circassian	Off	Belle	Isle.			
27-28	State of Penn	47 43	50 33	6.19 p. m.	47 10	51 47	2.27 a. m.
29	Michigan	43 15	44 25	5 a. m	42 36	45 45	4 p. m.
29	Galileo	42 51	50 55		42 49	51 55	
30	City of Rome	45 27	45 37		44 12	50 55	
31	Rugia	42 20	47 50	7.30 a. m.	42 20	48 05	8.30 a. m.
31	Lann	45 38	44 30	1 a. m	45 26	45 15	3 a. m.

The limits of fog-belts to the westward of the fortieth meridian are shown on chart i by dotted shading. In the vicinity of Newfoundland fog was reported on twenty-eight days, as compared with twenty-three days for June, and the southern limit remained about the same. Over and south of Sable Island Bank fog was less frequently encountered than during the preceding month, while over and near Georges and Nantucket Shoals it was reported on thirteen days.

As compared with the corresponding month of 1887, an increase of five is shown in the number of days for which fog has been reported over or near the Newfoundland Banks during July, 1888, and the southern limits, about lat. N. 40° 30′, are the same in each year. An increase of five days of fog is also shown in the vicinity of Georges and Nantucket Shoals, where the fog-belt is extended somewhat to the east and west.

The almost daily occurrence of fog near Newfoundland during July, 1888, may be ascribed to the unusual prevalence of south to east winds in that locality, which directions were in turn occasioned by the presence or influence of cyclonic areas which so frequently appeared to the westward or northward. The differences in temperature between the warm, moisture-laden air from over the Gulf Stream and that which immediately overlies the surface of the cold Arctic current and ice-fields are more marked at this season, and fog is, therefore, more readily developed attending their contact. In the vicinity of Georges and Nantucket Shoals fog apparently originated principally from the air from over the warm waters of the Gulf stream being blown by south to east winds over the Shoals where the colder deep-flowing water of the Arctic current were forced to the surface, and in part by the intermingling of the warm ocean air with the colder northerly air currents from the land which followed the passage of cyclonic areas.

OCEAN ICE.

The following table shows the southern and eastern limits of the region within which icebergs or field ice were reported for July during the last six years:

Southern limit.			Eastern limit.		
Month.	Lat. N.	Long. W.	Month.	Lat. N.	Long. W.
	° ′	° ′		° ′	° ′
July, 1883	42 42	49 57	July, 1883	46 47	45 44
July, 1884	46 24	50 02	July, 1884	48 36	46 28
July, 1885	42 14	48 30	July, 1885	48 00	44 00
July, 1886	42 59	49 18	July, 1886	45 52	†34 30
July, 1887	43 30	50 05	July, 1887	52 04	41 16
July, 1888	*	*	July, 1888	47 40	50 10

*Off Cape Race. †An isolated iceberg and some field ice.

On chart i the following positions of icebergs and field ice are shown by ruled shading:

1st.—S. S. "Sarnia," from Greenly Island to Cape Norman, a great quantity of field ice and small bergs.

2d.—S. S. "Grecian," in Strait of Belle Isle, a large quantity of field ice and bergs; s. s. "Sarnia," from Cape Norman to Belle Isle, numerous large bergs.

3d.—S. S. "Felicia," 200 miles east of Belle Isle, an iceberg.

5th.—S. S. "Scandinavian," N. 47° 40′, W. 50° 10′, a large berg; s. s. "Lake Huron," 60 miles e. by n. from Belle Isle, a large berg, and in the Strait numerous bergs and field ice; s. s. "Lake Superior," many bergs in the Strait of Belle Isle, and a large one 70 miles to the eastward.

6th.—S. S. "Colina," from 20 miles east of Belle Isle through the Strait, numerous bergs; s. s. "Lake Superior," N. 52° 45′, W. 50° 57′, a large berg.

8th.—S. S. "Circassian," N. 50° 20°, W. 58° 40′, several large bergs.

10th.—S. S. "Baumwall," from 20 miles east of Belle Isle through the Strait, numerous bergs of various sizes.

12th.—S. S. "Sarmatian," N. 52° 28′, W. 53° 24′, 4.30 a. m., a large berg; N. 52° 23′, W. 53° 44′, 5.30 a. m., a large berg; 10 a. m., off Belle Isle, 40 large bergs; several small, flat bergs in the Strait extending from Belle Isle to Greenly Island; 60 miles west of Greenly Island, two large bergs.

13–14th.—S. S. "Siberian," small field ice along Labrador

and Newfoundland shores, and forty large and small bergs at entrance to Belle Isle Strait.

14th.—S. S. "Toronto," from Strait of Belle Isle to Point Amour, numerous icebergs; from Belle Isle Light to Greenly Island, many bergs close to the north shore.

15th.—S. S. "Concordia," from 60 miles east of Belle Isle, in Strait, and as far west as Greenly Island, a great number of bergs.

16th.—S. S. "Suez," off Cape Race, two bergs.

18th.—S. S. "Parisian," 60 miles east of Belle Isle, a great number of bergs; from Belle Isle to Point Amour, coast thickly studded with bergs, and from Point Amour to Mectina, a few bergs.

20th.—S. S. "Lake Winnipeg," in Strait of Belle Isle, a number of bergs; s. s. "Sarnia," from Belle Isle to Cape Norman, several bergs.

21st.—Several large and small bergs between Cape Norman and Belle Isle.

22d.—S. S. "Gothenburg," N. 46° 38′, W. 52° 45′, a small berg; s. s. "Nestorian," off Cape Norman, eight bergs.

23d.—S. S. "Hibernian," N. 52° 24′, W. 53° 32′, a large berg; s. s. "Cremon," N. 51° 30′, W. 55° 45′, a berg.

25th.—S. S. "Hibernian," from Belle Isle to Point Amour, a large number of bergs.

26th.—S. S. "Surrey," off Cape Race, two bergs; s. s. "Lake Superior," N. 52° 37′, W. 53° 18′, several large bergs; off Belle Isle, numerous large bergs; s. s. "Oregon," N. 52° 30′, W. 53° 06′, a few bergs; in Strait of Belle Isle, bergs.

27th.—S. S. "Circassian," off Belle Isle, a number of large bergs.

27–29th.—S. S. "Grecian," steaming along the east and south coasts of Newfoundland, saw two bergs, one off Cape Bonavista and the other off Cape Race.

28th.—S. S. "State of Pennsylvania," off Cape Race, four bergs close under the land.

In July, 1888, no ice was reported over the Banks of Newfoundland, and its presence along the south and east coasts of Newfoundland was not indicated during the first half of the month. Numerous icebergs and quantities of field ice were observed in the Strait of Belle Isle and off the coasts of Labrador and northern Newfoundland during the entire month. Subsequent to the 15th icebergs were encountered in the vicinity of Cape Race on six days.

As compared with June, 1888, the southern limit of ice has contracted about 3°, and the easternmost position in which ice has been reported for July is about 7° farther west than in the preceding month. The heavy flow of Arctic ice along the northern coasts of Newfoundland, noted during the latter half of June, has continued, while off the south and east coasts of Newfoundland there was a marked decrease in the quantity of ice observed. As compared with the corresponding month of previous years, the southernmost ice reported for July, 1888, was about 2°.5 north of the average southern limit, and the easternmost ice observed was about 6° west of the mean eastern limit. Off the east and south coasts of Newfoundland the aggregate quantity of ice reported was largely deficient when compared with the July average, while in the Strait of Belle Isle and along the Labrador and northern Newfoundland coasts the total amount observed coincided with the average for the month.

TEMPERATURE OF THE AIR (expressed in degrees, Fahrenheit).

The distribution of mean temperature over the United States and Canada for July, 1888, is exhibited on chart ii by dotted isothermal lines. In the table of miscellaneous data are given the monthly mean temperatures, with the departures from the normal, for the various stations of the Signal Service. The figures opposite the names of the geographical districts in the columns for mean temperature, precipitation, and departures from the normal show, respectively, the averages for the several districts. The normal for any district may be found by adding the departure to the current mean when the departure is below the normal and subtracting when above.

The temperature was below the normal in northern California, along the southwestern border from the lower Rio Grande valley to the Colorado River, in the Lake region, Ohio Valley, and in the states bordering on the Atlantic and Gulf. In all other districts it was normal or above. The greatest deficiency of temperature occurred in the upper Ohio valley, lower lake region, and in the states bordering on the Atlantic, the greatest excess occurring over the middle Rocky Mountain slope and Missouri Valley. Over the greater part of the country the monthly mean temperatures differed but slightly from the normal. The departures were nowhere more than 4° and at most stations were less than 3°.

The following are some of the most marked departures from normal temperatures at the older established Signal Service stations:

Above normal.	°	Below normal.	°
Huron, Dak	2·4	Norfolk, Va	4·7
Cheyenne, Wyo	2·2	Wilmington, N. C	4·1
Dodge City, Kans	2·0	Philadelphia, Pa	3·9
Fort Elliott, Tex	2·0	Charleston, S. C	3·5
Leavenworth, Kans	2·0	Savannah, Ga	3·5
Yankton, Dak	1·8	Hatteras, N. C	3·4

The maximum temperatures over the greater part of the country during the month were not unusual, but in a few districts, viz., the middle Pacific coast, Missouri and lower Mississippi valleys, they were exceptionally high, reaching, in numerous instances, within a fraction of a degree the highest recorded since the establishment of Signal Service stations, and at San Francisco, Cal., it exceeded the former July maximum by about 10°. At New Orleans the previous July maximum was also exceeded, that of July, 1888, being half a degree higher than the former maximum. The records at both New Orleans and San Francisco cover eighteen years. All of the unusually high temperatures occurred about the middle of the month, most stations reporting the maximum on the 15th.

The minimum temperatures closely approached, and in a few instances fell below, any previously recorded in the states bordering on the Atlantic and in the north Pacific coast region, those occurring about the 13th on the middle Atlantic coast being the most notable.

RANGES OF TEMPERATURE.

The monthly and the greatest and least daily ranges of temperature at Signal Service stations are given in the table of miscellaneous meteorological data. The greatest monthly ranges occurred over the plateau districts, eastern Rocky Mountain slope, and upper Missouri valley, where they generally exceeded 50°; they were, as usual, least along the Gulf and north Pacific coasts, where they fell to 25°, or below, at many stations.

The following are some of the extreme monthly ranges:

Greatest.	°	Least.	°
Boisé City, Idaho	59·0	Corpus Christi, Tex	17·0
Fort Klamath, Oreg	59·0	Galveston, Tex	17·8
Fort Verde, Ariz	58·7	Cedar Keys, Fla	19·4
Fort Assinaboine, Mont	58·0	Tatoosh Island, Wash	19·9
Fort Custer, Mont	57·9	Brownsville, Tex	21·8
Carson City, Nev	56·4	Key West, Fla	22·3

DEVIATIONS FROM NORMAL TEMPERATURES.

The following table shows for certain stations, as reported by voluntary observers, (1) the normal temperatures for a

series of years; (2) the length of record during which the observations have been taken, and from which the normal has been computed; (3) the mean temperature for July, 1888; (4) the departures of the current month from the normal; (5) and the extreme monthly means for July during the period of observations and the year of occurrence:

State and Station.	County.	(1) Normal for the month of July.	(2) Length of record.	(3) Mean for July, 1888.	(4) Departure from normal.	(5) Extreme monthly mean temperature for July.			
						Highest.		Lowest.	
						Am't.	Year.	Am't.	Year.
		°	Years	°	°	°		°	
Arkansas.									
Lead Hill	Boone	80.6	6	84.2	+3.6	.....	.....	.....	.....
California.									
Sacramento	Sacramento	73.3	22	70.2	−3.1	78.7	1870	69.4	1887
Connecticut									
Southington	Hartford	71.3	19	69.2	−2.1	76.0	1887	68.5	1884
Florida.									
Merritt's Island	Brevard	79.9	5	80.2	+0.3	80.8	1887	78.2	1886
Illinois.									
Golconda	Pope	79.4	11	79.5	+0.1	.....	.....	.....	.....
Greenville	Bond	78.9	10	76.8	−2.1	.....	.....	.....	.....
Griggsville	Livingston	79.4	10	78.0	−1.4	.....	.....	.....	.....
Peoria	Peoria	78.0	32	79.7	+1.7	.....	.....	.....	.....
Riley	McHenry	70.7	27	70.7	0.0	.....	.....	.....	.....
Rockford	Winnebago	72.3	16	71.4	−0.9	.....	.....	.....	.....
Indiana.									
Logansport	Cass	76.1	34	78.0	+1.9	82.0	1866	.....	.....
Vevay	Switzerland	78.7	21	76.7	−2.0	.....	.....	.....	.....
Iowa.									
Cresco	Howard	71.5	15	72.2	+0.7	.....	.....	.....	.....
Independence	Buchanan	72.7	12	73.2	+0.5	76.0	1887	68.0	1882
Monticello	Jones	73.0	35	75.3	+2.3	80.2	1868	63.2	1863
Kansas.									
Lawrence	Douglas	78.0	21	79.5	+1.5	85.1	1868	72.0	1882
Wellington	Sumner	78.1	10	80.9	+2.8	81.2	1887	73.0	1882
Louisiana.									
Point Pleasant	Tensas	83.4	7	83.4	0.0	.....	.....	.....	.....
Maine.									
Gardiner	Kennebec	68.7	52	67.5	−1.2	74.2	1854	65.0	1884
Maryland.									
Cumberland	Alleghany	73.4	17	70.3	−3.1	77.7	1887	70.3	1888
Massachusetts.									
Somerset	Bristol	74.2	18	71.4	−2.8	.....	.....	.....	.....
Michigan.									
Thornville	Lapeer	72.9	12	69.7	−3.2	.....	.....	.....	.....
Kalamazoo	Kalamazoo	72.5	13	72.4	−0.1	.....	.....	.....	.....
Adrian	Lenawee	71.6	11	72.2	+0.6	.....	.....	.....	.....
New Jersey.									
South Orange	Essex	73.2	18	69.4	−3.8	77.8	1876	69.3	1884
Moorestown	Burlington	75.3	25	70.6	−4.7	76.8	1863	70.6	1888
New York.									
Palermo	Oswego	69.2	35	67.0	−2.2	79.1	1868	62.1	1860
Ohio.									
Wauseon	Fulton	72.8	18	71.6	−1.2	75.3	1878	67.7	1882
Oregon.									
Albany	Linn	66.1	10	65.8	−0.3	68.9	1886	63.2	1881
Eola	Polk	64.4	18	61.8	−2.6	.....	.....	.....	.....
Pennsylvania.									
Dyberry	Wayne	68.1	21	63.7	−4.4	73.8	1868	60.8	1884
Wellsborough	Tioga	70.9	15	65.6	−5.3	76.1	1881	67.1	1879
South Carolina.									
Stateburg	Sumter	79.1	8	77.9	−1.2	84.0	1881	77.5	1882, '86
Tennessee.									
Milan	Gibson	78.3	6	80.0	+1.7	92.6	1887	67.5	1886
Texas.									
New Ulm	Austin	82.7	17	81.6	−1.1	85.0	1879	80.6	1880
Vermont.									
Strafford	Orange	69.3	14	68.8	−0.5	73.5	1887	67.0	1881
Virginia.									
Bird's Nest	Northampt'n	79.2	19	74.7	−4.5	84.0	1887	74.7	1888
Wytheville	Wythe	72.4	24	74.0	+1.6	75.6	1887	67.0	1861
West Virginia.									
Helvetia	Randolph	70.0	12	68.0	−2.0	73.8	1887	66.6	1884

Table of comparative maximum and minimum temperatures for July.

State or Territory.	Stations.	For 1888.		Since establishment of station.				Length of record.
		Max.	Min.	Max.	Year.	Min.	Year.	
		°	°	°		°		Yrs.
Alabama	Mobile	96.6	68.5	101.0	1883	63.8	1882	18
Do	Montgomery	97.6	67.2	106.9	1881	60.8	1882	16
Arizona	Prescott	96.1	45.7	103.0	1878	42.0	1879	13
Do	Fort Apache	100.8	50.0	102.5	1881	41.0	1879	10
Arkansas	Fort Smith	99.5	63.4	104.5	1884	61.0	1882	7
Do	Little Rock	97.3	65.6	101.3	1884	61.0	1882	10
California	San Francisco	93.4	51.0	83.0	1881, 1884	49.0	1874, 1881	18
Do	San Diego	77.2	54.6	86.0	1877	53.7	1884	17
Colorado	Denver	100.3	51.4	103.3	1874	42.0	1873	17
Do	Montrose	97.0	45.9	98.2	1886	47.8	1887	4
Connecticut	New Haven	89.8	50.6	95.0	1876	50.3	1885	16
Do	New London	86.5	53.5	93.0	1876, 1878	51.0	1879	17
Dakota	Fort Buford	95.0	49.0	105.9	1886	37.5	1884	10
Do	Yankton	101.8	54.2	103.0	1883	44.0	1877	16
Dis. of Columbia	Washington City	93.7	55.5	103.8	1887	54.1	1885	18
Florida	Jacksonville	92.4	68.0	104.0	1879	68.0	1879	17
Do	Key West	90.5	68.2	99.5	1886	70.1	1887	18

Table of comparative maximum and minimum temperatures, &c.—Cont'd.

State or Territory.	Stations.	For 1888.		Since establishment of station.				Length of record.
		Max.	Min.	Max.	Year.	Min.	Year.	
		°	°	°		°		Yrs.
Georgia	Atlanta	94.5	65.3	100.0	1887	57.8	1882	10
Do	Savannah	99.1	66.9	105.0	1879	65.4	1885	18
Idaho	Boisé City	102.4	43.4	106.9	1886	40.0	1883	12
Illinois	Cairo	95.0	64.8	99.0	1881	60.0	1883	17
Do	Chicago	94.3	56.3	99.8	1887	50.0	1873	17
Indiana	Indianapolis	94.8	57.5	101.0	1881	47.5	1885	16
Indian Ter	Fort Sill	99.0	59.8	107.0	1884	56.0	1877, 1880	12
Iowa	Dubuque	94.5	54.0	101.0	1874	50.4	1882	16
Do	Des Moines	99.0	56.8	104.4	1886	52.0	1887	10
Kansas	Dodge City	102.0	59.5	108.0	1876	50.0	1877	14
Do	Leavenworth	97.0	60.5	104.0	1874	53.5	1882	18
Kentucky	Louisville	95.6	60.8	102.0	1874	54.0	1885	16
Louisiana	New Orleans	96.5	72.0	96.0	1877	69.8	1882	18
Do	Shreveport	98.5	66.9	107.0	1875	64.0	1882	16
Maine	Eastport	77.3	45.2	87.4	1886	45.0	1882, 1884	16
Do	Portland	87.1	50.5	97.0	1876	48.5	1886	17
Maryland	Baltimore	94.3	56.8	101.8	1887	56.0	1885	16
Massachusetts	Boston	88.0	5.10	101.0	1880	46.0	1874	18
Michigan	Marquette	90.5	46.6	100.0	1878	38.0	1886	15
Do	Grand Haven	84.0	49.0	90.0	1878	40.0	1873	16
Minnesota	Saint Vincent	89.0	45.4	94.9	1886	38.1	1887	8
Do	Saint Paul	94.0	55.5	100.0	1883	46.0	1873	16
Mississippi	Vicksburg	97.0	65.3	100.0	1881	62.0	1881	16
Missouri	Saint Louis	97.9	64.5	104.0	1881	57.0	1876	18
Montana	Ft. Assinaboine	102.0	44.0	108.4	1886	35.0	1881	9
Do	Helena	99.1	46.5	103.1	1886	38.0	1880	9
Nebraska	North Platte	101.2	53.4	107.0	1877	45.0	1882	14
Do	Omaha	101.2	60.0	105.0	1874	51.0	1873	16
Nevada	Winnemucca	96.0	40.5	104.0	1877	37.0	1877, 1878	9
New Jersey	Atlantic City	91.0	54.8	99.0	1880	53.0	1880	15
New Mexico	Santa Fé	96.6	51.0	95.5	1878	46.0	1872, 1880	15
New York	Buffalo	84.0	48.6	92.1	1887	47.5	1876	16
Do	New York City	89.9	55.3	99.0	1876	56.2	1885	18
North Carolina	Charlotte	99.6	60.0	102.2	1887	56.1	1885	10
Do	Wilmington	95.9	59.8	103.0	1879	62.0	1881	18
Ohio	Cincinnati	95.4	58.2	103.5	1881	53.0	1885	18
Do	Sandusky	90.4	57.0	98.0	1887	53.1	1885	11
Oregon	Portland	97.0	46.0	99.0	1885	45.7	1887	16
Do	Roseburg	100.0	44.7	100.8	1885	39.6	1887	12
Pennsylvania	Pittsburg	90.3	50.5	102.7	1881	50.0	1885	16
Do	Philadelphia	93.8	56.8	100.0	1876	56.0	1883	18
Rhode Island	Block Island	.....	.....	87.8	1885	55.0	1883	8
South Carolina	Charleston	102.0	67.5	104.0	1879	64.7	1886	16
Tennessee	Knoxville	93.0	60.4	100.2	1887	52.2	1885	18
Do	Memphis	97.2	66.4	99.0	1875, 79, 81	60.0	1882	17
Texas	Brownsville	93.8	72.0	98.0	1877	65.1	1887	12
Do	Fort Elliott	101.4	60.2	102.0	1881	49.0	1880	9
Utah	Salt Lake City	97.9	51.7	99.7	1885	45.0	1880	15
Virginia	Lynchburg	95.0	55.4	101.8	1887	54.4	1885	16
Do	Norfolk	94.2	58.3	102.5	1887	59.4	1885	18
Washington	Spokane Falls	96.1	42.2	100.3	1886	41.4	1887	8
Do	Olympia	92.0	40.5	97.0	1885	39.8	1887	12
Wisconsin	La Crosse	90.9	56.9	101.0	1874	48.7	1887	17
Do	Milwaukee	90.8	52.5	99.9	1887	49.7	1886	17
Wyoming	Cheyenne	97.2	45.2	105.0	1881	37.6	1882	16

FROST.

Frosts are reported to have occurred as follows: *Colorado:* Pike's Peak, 18th, 19th, 24th. *Nevada:* Carson City, 1st, 13th, 27th. *New Hampshire:* Mount Washington, 15th, 16th, 30th. *New York:* West Monroe, 1st. *Oregon:* Fort Klamath, 2d, 26th. *Pennsylvania:* Wellsborough, 13th, 14th, 16th.

Heavy frost occurred at Humphrey, Cattaraugus Co., N. Y., on the 16th, causing considerable damage to corn, buckwheat, vines, etc.

AVERAGE DATE OF FIRST KILLING FROST AT STATIONS OF VOLUNTARY AND STATE WEATHER SERVICE OBSERVERS.

Chart number vi shows, in graphic form, the average date on which the first killing frost occurs generally over the country. This chart has been prepared solely from observations made at voluntary observers' stations. The data from the regular Signal Service stations were not incorporated because it is believed that observations as to the occurrence of frost are made in the country with greater opportunities for accuracy as to earliest date and extent of damage than in large cities, where Signal Service stations are generally located. In the preparation of the chart and table diligent effort has been made to secure reliable information as to killing frosts *only*, especially those frosts which were injurious to vegetables and other crops. It is probable that in some cases the first frost reported may have been "light" instead of "killing." It was found that killing frost occurred throughout the year along the northern boundary of the United States north of Dakota and Minnesota. In California killing frosts are very unusual in the extreme east and northeast portions. Through-

out the western portion of the state light frosts in winter (appearing about the middle of December and continuing not later than February) are not unusual, but rarely injure even delicate plants. The observations from which deductions have been made vary in length of records of from two to forty-nine years, thirty-six stations having records of fifteen years or more. The total number of stations involved in the work number four hundred and thirty-two.

The following table shows (1) the number of years of observation from which the data is drawn; (2) the average date of first killing frost; (3) the earliest date of first killing frost; (4) the extreme interval (number of days) between the earliest date and the average; (5) the last date of first killing frost; (6) the extreme interval between the latest date and the average; (7) the number of intervals of ten days or more; (8) the percentage of times when the interval was less than ten days:

Station.	Number of years, record.	Average date.	Earliest date.	Extreme interval, days.	Latest date.	Extreme interval, days.	Number of times interval was ten days or more.	Per cent. of times interval was less than ten days.
Arkansas.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lead Hill	7	Oct. 27	Oct. 12	15	Nov. 13	17	3	57
California.								
Washington	24	Oct. 28	Sept. 30	28	Nov. 16	19	9	62
Willows	7	Nov. 19	Oct. 30	20	Nov. 21	3	3	57
Sacramento	23	Nov. 19	Oct. 17	33	Dec. 31	42	18	22
Colorado.								
Como (near)	6	Aug. 23	Aug. 7	16	Sept. 15	23	3	50
Fort Collins	5	Sept. 9	Aug. 30	10	Oct. 1	22	2	60
Husted	6	Sept. 10	Aug. 31	10	Sept. 15	5	1	83
Connecticut.								
Middletown	29	Oct. 2	Sept. 10	22	Oct. 22	20	12	59
Southington	18	Oct. 13	Oct. 1	12	Nov. 2	20	7	61
Dakota.								
Gallatin	7	Sept. 13	Sept. 1	12	Oct. 1	18	2	71
Highmore	5	Sept. 7	Sept. 1	6	Sept. 15	8	0	100
Florida.								
Archer	3	Nov. 7	Oct. 31	7	Nov. 17	10	1	80
Mayport	10	Dec. 3	Nov. 11	21	Dec. 16	14	2	80
Saint Augustine	6	Dec. 24	Nov. 30	24	Feb. 6	44	4	33
Georgia.								
Forsyth	13	Nov. 8	Oct. 17	22	Nov. 25	17	3	77
Illinois.								
Aledo	6	Oct. 16	Oct. 1	15	Oct. 25	9	2	67
Anna	12	Oct. 23	Sept. 30	23	Nov. 15	23	5	58
Aurora	5	Sept. 4	Aug. 2	33	Sept. 29	25	2	60
Eberle	5	Nov. 2	Oct. 12	21	Dec. 5	33	3	40
Fairfield	5	Oct. 13	Oct. 1	12	Oct. 23	10	2	60
Golconda	10	Oct. 5	Sept. 14	24	Nov. 5	28	7	30
Griggsville	6	Oct. 22	Oct. 3	19	Nov. 12	21	3	38
Marengo	7	Sept. 16	Sept. 5	11	Sept. 29	13	3	57
Mascoutah	6	Nov. 9	Oct. 30	10	Nov. 30	11	3	67
Mattoon	8	Oct. 2	Sept. 9	23	Nov. 5	32	5	38
Melvin	15	Oct. 16	Sept. 27	19	Nov. 22	36	8	47
Oswego	8	Oct. 18	Oct. 5	13	Oct. 30	12	3	62
Palestine	5	Sept. 22	Sept. 9	13	Sept. 29	7	1	80
Peoria	33	Oct. 27	Oct. 1	26	Nov. 17	21	11	66
Pontiac	5	Sept. 17	Sept. 2	15	Sept. 28	11	3	40
Prairieville	5	Sept. 22	Sept. 9	13	Oct. 6	14	3	40
Rockford	15	Sept. 29	Sept. 9	20	Oct. 19	20	9	40
Sandwich	38	Sept. 26	Aug. 28	29	Nov. 28	63	22	42
Springfield	6	Sept. 23	Sept. 8	14	Oct. 19	27	5	17
Sycamore	6	Sept. 11	Aug. 24	18	Oct. 5	24	6	0
Indiana.								
Blue Lick	17	Oct. 27	Oct. 9	18	Nov. 15	19	8	53
Connersville	6	Oct. 11	Sept. 21	20	Nov. 1	21	2	67
Jeffersonville	5	Oct. 13	Oct. 2	11	Oct. 27	14	2	60
Laconia	14	Oct. 2	Sept. 14	18	Oct. 30	28	7	30
Mount Vernon	5	Oct. 5	Sept. 24	11	Oct. 14	9	1	80
Sunman	5	Oct. 17	Oct. 2	15	Nov. 1	15	3	40
Vevay	14	Oct. 5	Sept. 14	21	Nov. 4	30	12	14
Iowa.								
Cresco	13	Aug. 26	Aug. 8	18	Sept. 17	22	7	46
Dubuque	5	Sept. 14	Sept. 4	10	Sept. 29	15	2	60
Elkader	9	Sept. 30	Aug. 31	30	Oct. 16	16	5	44
Glenwood	29	Sept. 25	Aug. 29	27	Oct. 20	25	12	59
Iowa City	6	Sept. 27	Sept. 9	18	Oct. 17	20	2	67
Monticello	38	Sept. 17	Aug. 25	23	Oct. 13	26	16	58
Muscatine	49	Sept. 25	Sept. 2	23	Oct. 27	32	31	37
Sibley	3	Sept. 9	Aug. 23	17	Sept. 28	19	4	30
Waukon	5	Sept. 7	Aug. 10	28	Sept. 20	13	3	40
Kansas.								
Lawrence	18	Oct. 20	.....	.....	.....	.....	.....	.....
Manhattan	8	Oct. 8	Sept. 28	10	Oct. 18	10	2	75
Morse	6	Sept. 16	Sept. 11	5	Sept. 20	4	0	100
Salina	6	Oct. 4	Sept. 6	28	Oct. 19	15	3	50
Yates Centre	9	Oct. 7	Sept. 16	21	Oct. 18	11	3	67
Kentucky.								
Bowling Green	6	Oct. 20	Oct. 1	19	Nov. 15	26	5	17
Frankfort	6	Oct. 13	Sept. 24	19	Nov. 1	19	4	33
Louisiana.								
Grand Coteau	6	Dec. 7	Nov. 29	8	Dec. 18	11	1	83
Maine.								
Gardiner	29	Oct. 1	Sept. 4	27	Oct. 22	21	10	65
Lewiston	12	Oct. 1	Sept. 14	17	Oct. 17	16	6	50
Orono	19	Sept. 29	Sept. 15	14	Oct. 7	8	2	89

Average date of first killing frost, &c.—Continued.

Station.	Number of years, record.	Average date.	Earliest date.	Extreme interval, days.	Latest date.	Extreme interval, days.	Number of times interval was ten days or more.	Per cent. of times interval was less than ten days.
Maryland.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Barren Creek Sp'gs	6	Oct. 12	Sept. 25	17	Nov. 3	22	3	50
Fallston	12	Oct. 4	Sept. 10	24	Oct. 25	21	8	33
McDonough School	5	Oct. 12	Oct. 1	11	Nov. 3	22	3	40
Woodstock College	13	Oct. 7	Sept. 15	22	Nov. 2	26	7	46
Massachusetts.								
Amherst	47	Sept. 30	Aug. 10	41	Oct. 8	18	18	16
Fall River	14	Sept. 21	Aug. 23	29	Oct. 12	21	10	29
Fitchburg	5	Sept. 24	Sept. 1	23	Oct. 21	27	5	0
Somerset	15	Oct. 18	Sept. 23	25	Nov. 3	16	7	53
Westborough	13	Sept. 11	Aug. 16	26	Oct. 5	24	7	46
Williamstown	8	Sept. 28	Aug. 25	34	Oct. 22	24	5	38
Michigan.								
Adrian	7	Oct. 10	Sept. 26	14	Oct. 26	16	2	71
Hudson	5	Sept. 10	Sept. 2	8	Sept. 21	11	2	60
Lansing	10	Aug. 31	Aug. 2	29	Oct. 4	34	7	30
Lansing (b'd of h'lth)	9	Oct. 4	Sept. 8	26	Oct. 23	19	6	33
Northport	10	Sept. 28	Sept. 9	19	Oct. 18	20	3	70
Minnesota.								
Northfield	5	Sept. 29	Sept. 5	24	Oct. 21	22	3	40
Mississippi.								
Holly Springs	32	Oct. 30	Oct. 10	20	Nov. 30	31	15	53
Missouri.								
Fayette	5	Oct. 13	Sept. 24	19	Nov. 5	23	8	.....
Ironton	9	Sept. 25	Sept. 2	23	Oct. 23	28	5	44
Kirksville	8	Oct. 14	Oct. 1	13	Oct. 23	9	4	50
Mexico	12	Oct. 11	Sept. 9	32	Oct. 27	16	4	67
Miami	8	Oct. 9	Sept. 13	26	Oct. 31	22	5	62
Oregon	33	Oct. 9	Sept. 17	22	Nov. 3	25	16	52
Montana.								
Virginia City	5	Sept. 18	Sept. 5	13	Oct. 8	20	4	20
Nebraska.								
Brownville	8	Oct. 21	Oct. 12	9	Nov. 2	12	1	88
De Soto	17	Oct. 10	Sept. 24	16	Oct. 31	21	8	53
Fremont	16	Oct. 17	Sept. 20	27	Nov. 9	23	9	44
Genoa	11	Oct. 1	Sept. 13	18	Nov. 1	31	7	36
Nebraska City	8	Oct. 15	Oct. 1	14	Oct. 29	14	3	62
Ravenna	13	Sept. 26	Sept. 12	16	Oct. 18	20	4	69
Syracuse	5	Oct. 14	Oct. 4	10	Oct. 27	13	2	60
Weeping Water	13	Sept. 13	Aug. 30	14	Oct. 9	26	4	69
New Hampshire.								
Concord	29	Oct. 3	Sept. 12	21	Oct. 30	27	10	66
New Jersey.								
Billingsport	7	Oct. 16	Oct. 3	13	Nov. 3	18	3	57
Dover	5	Sept. 19	Sept. 10	9	Oct. 1	12	1	80
Readington	13	Oct. 4	Sept. 14	20	Nov. 3	30	5	62
South Orange	18	Oct. 20	Oct. 5	15	Nov. 3	14	5	72
New York.								
Cooperstown	30	Sept. 27	Sept. 3	24	Oct. 22	25	13	57
Cortland	8	Sept. 14	Aug. 19	26	Sept. 30	16	5	38
Factoryville	20	Oct. 7	Aug. 24	44	Oct. 30	23	10	50
Fortsville	10	Sept. 22	Sept. 12	10	Oct. 10	18	2	80
Humphrey	5	Sept. 6	Aug. 28	9	Sept. 17	11	1	80
Palermo	27	Sept. 19	Aug. 16	34	Nov. 21	63	13	52
Savona	6	Oct. 1	Sept. 10	21	Oct. 17	16	3	50
North Carolina.								
Greensborough	7	Oct. 16	Sept. 24	22	Nov. 6	21	4	43
Lenoir	14	Oct. 4	Sept. 15	19	Nov. 1	28	5	64
Raleigh	9	Oct. 10	Sept. 14	26	Nov. 2	23	5	44
Weldon	16	Oct. 20	Oct. 3	17	Nov. 9	20	5	69
Ohio.								
Clarksville	5	Oct. 16	Sept. 24	22	Nov. 14	29	3	40
Cleveland	21	Oct. 24	Oct. 9	15	Nov. 15	22	10	52
MargarettaTownship	10	Oct. 10	Sept. 10	30	Nov. 1	23	6	40
Napoleon	5	Sept. 12	Sept. 1	11	Sept. 21	9	2	60
North Lewisburg	16	Oct. 19	Oct. 2	17	Nov. 18	30	6	62
Portsmouth	44	Oct. 11	Sept. 11	30	Nov. 14	34	21	52
Quaker City	5	Sept 18	Sept. 9	9	Sept. 24	6	0	100
Urbana	6	Sept. 17	Sept. 9	8	Sept. 22	5	0	100
Wauseon	18	Sept. 26	Sept. 2	24	Oct. 10	14	6	67
Tiffin	5	Oct. 1	Sept. 19	12	Oct. 24	23	2	60
Oregon.								
Albany	9	Oct. 26	Oct. 3	23	Nov. 21	26	3	67
Bandon	14	Oct. 9	Sept. 9	30	Nov. 18	40	11	21
Eola	13	Oct. 26	Oct. 9	19	Nov. 29	32	8	33
Portland	14	Nov. 11	Oct. 14	28	Dec. 6	25	9	36
Roseburg	11	Nov. 4	Oct. 13	22	Nov. 30	26	7	36
Pennsylvania.								
Carlisle	8	Oct. 1	Sept. 15	16	Oct. 19	18	5	38
Corry	8	Sept. 19	Sept. 2	17	Oct. 9	20	3	62
Dyberry	26	Sept. 23	Aug. 30	24	Oct. 21	28	9	65
New Bloomfield	12	Sept. 28	Sept. 10	18	Oct. 22	24	7	42
Pottstown	29	Oct. 7	Sept. 4	33	Oct. 27	20	9	69
Quakertown	7	Oct. 2	Sept. 10	22	Oct. 25	23	4	44
Wellsborough	14	Oct. 13	Sept. 24	19	Nov. 16	34	8	43
West Chester	9	Sept. 28	Sept. 16	12	Oct. 25	27	3	67
South Carolina.								
General average	.....	Oct. 25	.....	.....	Nov. 23	29	.....	.....
Stateburg	.....	Nov. 17	Nov. 2	15	Nov. 30	13	4	43
Tennessee.								
Andersonville	5	Oct. 13	Sept. 24	19	Oct. 31	18	3	40
Ashwood	8	Oct. 3	Sept. 14	19	Oct. 15	12	4	50
Austin	5	Oct. 9	Sept. 24	15	Oct. 30	21	4	20
Beech Grove	5	Oct. 13	Sept. 24	19	Oct. 31	18	4	20
Bolivar	5	Oct. 20	Oct. 7	13	Oct. 28	8	1	80
Careyville	5	Oct. 20	Sept. 24	26	Oct. 30	10	2	60
Cookeville	5	Oct. 8	Sept. 19	19	Oct. 31	23	5	0
Covington	5	Oct. 22	Oct. 12	10	Oct. 28	6	1	80
Farmingdale	5	Oct. 6	Sept. 20	16	Oct. 31	25	3	50
Florence	5	Oct. 7	Sept. 21	16	Oct. 26	19	4	20
Greeneville	5	Oct. 16	Sept. 24	22	Oct. 31	15	4	20

Average date of first killing frost, &c.—Continued.

Station.	Number of years, record.	Average date.	Earliest date.	Extreme interval, days.	Latest date.	Extreme interval, days.	Number of times interval was ten days or more.	Per cent. of times interval was less than ten days.
Tennessee—Cont'd.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Hohenwald	5	Oct. 8	Sept. 24	14	Oct. 31	23	5	0
Howell	5	Oct. 12	Sept. 24	18	Oct. 31	19	4	20
Hurricane Switch	5	Oct. 11	Sept. 24	17	Oct. 31	20	3	40
Jonesboro	5	Oct. 12	Sept. 23	19	Oct. 31	19	4	20
Lexington	5	Oct. 17	Oct. 3	14	Oct. 31	14	3	40
McMinnville	5	Oct. 17	Oct. 3	14	Oct. 31	14	3	40
Manchester	5	Oct. 12	Sept. 24	18	Oct. 31	9	4	20
Milan	5	Oct. 26	Oct. 22	4	Nov. 2	7	0	100
Paris	5	Oct. 5	Sept. 21	14	Oct. 24	19	3	40
Parksville	5	Oct. 7	Sepr. 24	23	Oct. 31	24	4	20
Riddleton	6	Oct. 10	Sept. 24	16	Nov. 1	22	4	33
Rodgersville	5	Oct. 8	Sept. 23	15	Oct. 30	22	4	20
Sailors Rest	5	Oct. 14	Sept. 24	20	Oct. 31	17	3	40
Somerville	5	Oct. 21	Oct. 7	14	Oct. 31	10	2	60
Trenton	5	Oct. 18	Sept. 24	24	Oct. 30	12	3	40
Waynesboro	5	Oct. 9	Sept. 24	15	Oct. 31	22	4	20
Texas.								
Clarksville	9	Oct. 17	Sept. 12	35	Nov. 13	26	4	56
New Ulm	12	Nov. 25	Nov. 12	13	Dec. 15	30	5	58
Utah.								
Coalville	8	Sept. 5	Aug. 10	26	Sept. 26	21	5	38
Vermont.								
Charlotte	17	Oct. 21	Oct. 8	13	Nov. 1	11	3	82
Lunenburgh	28	Sept. 20	Aug. 5	46	Nov. 16	57	16	43
Virginia.								
Dale Enterprise	19	Oct. 2	Sept. 15	17	Oct. 31	29	7	63
Woodlawn	10	Oct. 13	Sept. 26	17	Nov. 6	24	6	40
Wytheville	10	Sept. 19	Aug. 26	24	Oct. 14	25	5	50
Washington Territory.								
Blakely	11	Nov. 16	Oct. 23	24	Dec. 10	24	7	36
Port Townsend	5	Nov. 8	Oct. 2	36	Dec. 7	29	4	20
Walla Walla	10	Oct. 26	Sept. 8	48	Feb. 28	125	8	20
West Virginia.								
Parkersburg	8	Oct. 25	Sept. 26	29	Nov. 22	28	6	25
Wisconsin.								
Deuster	9	Sept. 9	Aug. 22	18	Sept. 18	9	1	89
Fond du Lac	8	Sept. 29	Sept. 9	20	Oct. 19	20	4	50
Manitowoc	31	Oct. 16	Sept. 18	28	Nov. 13	28	17	45

TEMPERATURE OF WATER.

The following table shows the temperature of the sea-water for July, 1888, observed, under conditions as given, at the harbors of the several stations; the monthly range of water temperature; the average depth at which the observations were made, and the mean temperature of the air:

Station.	Temperature at bottom.				Mean temperature of air at the station.
	Max.	Min.	Range.	Monthly mean.	
	°	°	°	°	°
Cedar Keys, Fla	89.9	85.0	4.9	87.5	80.8
Charleston, S. C	85.5	81.0	4.5	83.1	78.5
Eastport, Me	48.2	45.0	3.2	46.7	58.1
Galveston, Tex	89.5	78.8	10.7	86.2	82.0
Key West, Fla	90.1	84.1	6.0	87.9	83.3
New York City	72.6	68.0	4.6	70.1	70.5
Pensacola, Fla	87.0	81.3	5.7	83.4	82.0
Portland, Me	58.5	50.4	8.1	55.8	65.5
Portland, Oregon	75.3	62.5	12.8	68.3	66.2

COTTON REGION REPORTS.

In the accompanying table are given for July, 1888, the average rainfall and the means of the maximum and minimum temperatures in the cotton regions, together with normals computed from similar observations of former years:

Temperature and rainfall data for the cotton districts, July.

Districts.	Rainfall.			Temperature.							
				Maximum.			Minimum.			Extremes for July, 1888.	
	Average for July of six preceding years.	Average for July, 1888.	Departures.	Mean for July of six preceding years.	Mean for July, 1888.	Departures.	Mean for July of six preceding years.	Mean for July, 1888.	Departures.	Max.	Min.
	Inches	*Inches*	*Inches.*	°	°	°	°	°	°	°	°
New Orleans	4.39	3.51	− 0.88	92.8	93.7	+ 0.9	72.9	71.0	− 1.9	104	50
Savannah	6.22	2.54	− 3.68	92.4	94.5	+ 2.1	72.1	71.7	− 0.4	104	60
Charleston	6.46	4.11	− 2.35	91.9	92.3	+ 0.4	70.8	69.5	− 1.3	103	53
Atlanta	4.97	3.27	− 1.70	90.2	91.1	+ 0.9	69.1	70.0	+ 0.9	104	57
Wilmington	5.53	3.21	− 2.32	91.0	90.3	− 0.8	69.4	67.3	− 2.1	104	54
Memphis	3.70	1.79	− 1.81	90.7	92.5	+ 1.8	68.8	69.7	+ 0.9	102	52
Galveston	2.09	2.36	+ 0.27	95.4	92.6	− 2.8	72.9	70.9	− 2.0	105	54
Vicksburg	5.16	2.11	− 3.05	92.1	92.9	+ 0.8	71.6	72.5	+ 0.9	100	62
Montgomery	5.01	2.64	− 2.37	91.5	93.8	+ 2.3	69.5	71.6	+ 2.1	100	61
Augusta	1.26	2.43	+ 1.17	92.3	92.0	− 0.3	70.4	69.7	− 0.7	108	56
Little Rock	2.55	2.82	+ 0.27	92.9	93.3	+ 0.4	68.2	72.3	+ 4.1	105	56
Mobile	4.05	4.90	+ 0.85	93.5	94.8	+ 1.3	70.3	71.9	+ 1.6	104	61

PRECIPITATION (expressed in inches and hundredths).

The rainfall has been in excess of the average in some districts, but for the most part it was below the average, the deficiencies being very marked in the districts of Savannah, Charleston, Wilmington, Vicksburg, and Montgomery. The means of the maximum and minimum temperatures differed but little from their respective normals.

The distribution of precipitation over the United States and Canada for July, 1888, as determined from the reports of about one thousand stations, is exhibited on chart iv. In the table of miscellaneous meteorological data are given, for each Signal Service station, the total precipitation, with the departures from the normal. The figures opposite the names of the geographical districts in columns for mean temperature, precipitation, and departures from the normal, show respectively the averages for the several districts. The normal for any district may be found by adding the departure to the current mean when the precipitation is below the normal, and subtracting when above.

So far as is shown by records of Signal Service stations, the rainfall during July was below the average over nearly the whole country, the only exception being a few areas of limited extent, the more important of which were two embracing, respectively, a part of the central Missisippi valley and northeastern Texas and the adjacent portions of the Indian Territory and Arkansas, where the monthly rainfalls were unusually heavy. The largest monthly rainfalls, however, occurred in the upper Ohio valley, and these were almost entirely due to the very heavy rains accompanying the storms described under areas of low pressure as numbers II and V.

It may be generally stated that, with the exception of Florida where the rainfall was about normal, in the states bordering on the Atlantic and east Gulf coasts the percentages of average precipitation ranged from 60 to 70; in the Lake regions, Ohio and Missouri valleys, middle plateau, and in the middle and southern Rocky Mountain slopes from 70 to 80. In the upper Mississippi valley, northern plateau, and on the north Pacific coast more than the average amount of rain fell, the percentage of excess ranging from 20 to 45.

HAIL.

Descriptions of the more severe hail storms of the month are given under "Local storms." In addition to those given under that heading, hail is reported to have fallen in the various states and territories as follows: 1st, Dak., Mass., Mont., Wyo. 3d, Iowa, Nev., Wis. 4th, Dak., Iowa, 5th, Mass., N. J., N. Mex., N. Y., Wyo. 6th, Mont., Tex. 7th, Colo., Iowa, N. H., W. Va. 8th, Colo., Mich., Wyo. 11th, Ariz., N. Y. 13th, Colo., Va. 14th, Colo. 16th, Colo., Nebr., Nev., Wyo. 17th, Colo., Kans. 18th, Colo., La., Oregon. 19th, Colo., N. Y., Pa. 20th, Dak., Mont., Pa., Va. 21st, Iowa. 22d, Ill., Nebr., Wis. 23d, Colo., Ind., Mich., Ohio. 24th, Ala., Colo., Ga., Mo. 25th, Colo., Minn., S. C., Wyo. 26th, Ill., Iowa, Wyo. 27th, Kans., Ohio, Pa. 28th, Ind., Mont., Tenn. 29th, Fla. 30th, Wyo. 31st, Ill., N. Y., Vt.

SNOW.

The only stations reporting snowfalls during the month were Pike's Peak, Colo., and Mount Washington, N. H. At the former snow occurred on the 7th, 14th, 15th, 18th, 19th, 21st, 25th, 26th (no amount reported), and at the latter on the 1st and 12th; total for the month seven inches.

DEVIATIONS FROM AVERAGE PRECIPITATION.

The following table shows for certain stations, as reported by voluntary observers, (1) the average precipitation for a series of years; (2) the length of record during which the observations have been taken, and from which the average has been computed; (3) the total precipitation for July, 1888; (4) the departures of the current month from the average; (5) and the extreme monthly precipitation for July during the period of observations and the year of occurrence:

State and station.	County.	(1) Average for the month of July.	(2) Length of record.	(3) Total for July, 1888.	(4) Departure from average.	(5) Extreme monthly precipitation for July. Greatest.		Least.	
						Am't.	Year.	Am't.	Year.
Arkansas.		*Inches*	*Years*	*Inches*	*Inches.*	*Inches*		*Inches.*	
Lead Hill	Boone	6.84	6	1.13	−5.69	......	......	......	......
California.									
Sacramento	Sacramento	0.01	22	0.01	0.00	0.21	1876	0.00	*
Connecticut.									
Southington	Hartford	3.87	19	1.85	−2.02	6.83	1876	1.02	1870
Florida.									
Merritt's Island	Brevard	5.95	11	5.65	−0.30	11.72	1884	0.86	1883
Illinois.									
Golconda	Pope	3.46	11	1.65	−1.81	......	......	......	......
Peoria	Peoria	4.00	32	6.48	+2.48	......	......	......	......
Riley	McHenry	3.80	27	3.44	−0.36	......	......	......	......
Indiana.									
Logansport	Cass	3.95	34	1.80	−2.15	13.10	1869	0.60	1856
Vevay	Switzerland	4.15	21	5.92	+1.77	9.80	1874	1.17	1868
Iowa.									
Cresco	Howard	4.27	16	4.52	+0.25	......	......	......	......
Independence	Buchanan	5.17	12	4.82	−0.35	10.40	1880	0.90	1886
Monticello	Jones	4.25	35	6.98	+2.73	10.93	1883	0.60	1874
Kansas.									
Lawrence	Douglas	4.26	21	4.28	+0.02	7.23	1883	0.11	1886
Wellington	Sumner	3.99	10	2.73	−1.26	6.64	1883	1.89	1884
Louisiana.									
Point Pleasant	Tensas	4.79	12	1.80	−2.99	......	......	......	......
Maine.									
Cornish	York	4.12	31	1.74	−2.38	......	......	......	......
Gardiner	Kennebec	3.40	30	2.20	−1.20	6.96	1887	1.07	1878
Maryland.									
Cumberland	Alleghany	3.69	17	4.34	+0.65	5.59	1887	1.01	1885
Massachusetts.									
Somerset	Bristol	3.74	18	3.80	+0.06	......	......	......	......
Michigan.									
Thornville	Lapeer	3.30	12	2.31	−0.99	......	......	......	......
Kalamazoo	Kalamazoo	3.53	13	2.37	−1.16	......	......	......	......
Adrian	Lenawee	3.81	11	3.88	+0.07	......	......	......	......
New Jersey.									
South Orange	Essex	4.07	18	2.62	−1.45	9.38	1887	1.03	1881
Moorestown	Burlington	4.18	25	7.03	+2.85	7.43	1877	1.40	1882
New York.									
Palermo	Oswego	3.30	35	3.13	−0.17	6.60	1874	0.64	1882
Ohio.									
Wauseon	Fulton	3.98	16	0.86	−3.12	7.26	1872	0.31	1886
Oregon.									
Albany	Linn	0.58	10	0.83	+0.25	1.87	1884	0.00	†
Eola	Polk	0.48	18	0.73	+0.25	......	......	......	......
Pennsylvania.									
Dyberry	Wayne	4.95	17	4.19	−0.76	9.28	1887	1.70	1885
Wellsborough	Tioga	3.66	15	3.50	−0.16	8.37	1883	1.05	1876
South Carolina.									
Stateburg	Sumter	3.64	8	4.10	+0.46	5.67	1885	1.70	1884
Kirkwood	Kershaw	4.57	22	2.70	−1.87	8.40	1867	0.39	1881
Tennessee.									
Milan	Gibson	3.94	6	1.49	−2.45	8.85	1884	1.49	1888
Texas.									
New Ulm	Austin	4.09	17	1.74	−2.35	14.38	1873	0.00	1884
Vermont.									
Strafford	Orange	4.28	14	3.00	−1.28	6.10	1880	2.00	1881
Virginia.									
Bird's Nest	Northampton	4.59	19	2.45	−2.14	8.90	1877	1.25	1873
Wytheville	Wythe	4.02	24	1.83	−2.19	8.10	1861	0.89	1883
West Virginia.									
Helvetia	Randolph	6.66	12	6.28	−0.38	10.00	1876	2.86	1887

* 1866 to 1875, 1877 to 1879, 1881 to 1887. † 1883 and 1885.

EXCESSIVE PRECIPITATION.

For the same reasons stated in the June REVIEW it is possible to publish in this issue a much greater amount of data bearing upon excessive rainfalls in July than it has been practicable to give for other months, with the exception of June, for which similar data has been given.

The records show that the sections of country subjected to monthly rainfalls of ten inches, or more, in June and July are much the same, viz., the upper Mississippi and Missouri valleys and south Atlantic states, and, also, that they occur in these months with about the same frequency. On the summit of Mount Washington, N. H., however, rainfalls exceeding ten inches per month were more numerous than at any other station, but in adjacent portions of New England they have not been common. Since the signal station was established on Mount Washington in 1870 July rainfalls have exceeded ten inches in ten years, the greatest, 23.70, occurring in 1884. The following are some of the largest monthly rainfalls shown by the records: White, Tenn., 28.11, 1883; Fernandina, Fla., 25.88, 1864; Lake Hook, Minn., 21.86, 1872. East of the Mississippi the states in which July rainfalls have not reached ten inches are the following: Delaware, Maine, Rhode Island, Vermont, and Virginia. In the Rocky Mountain and plateau regions and on the Pacific coast the largest monthly rainfalls have not reached ten inches, the most remarkable falls in these districts being the following: 9.67 at Fort Assinaboine in 1884; 9.00 at Fort Grant, Arizona, in 1887, and 6.52 at Tatoosh Island, Wash., in 1886. The largest rainfall on record as having occurred in California in July is 2.32, reported from Campo in 1878.

From the Atlantic coast westward to the one hundredth meridian daily rainfalls amounting to 2.50 inches, or more, per hour have occurred with more or less frequency at most of the Signal Service stations. They have been most numerous in the upper Mississippi, lower Missouri, and Ohio valleys, and in the states bordering on the Atlantic and east Gulf coasts, stations on coasts of the Carolinas showing the greatest number. At both Wilmington, N. C., and Charleston, S. C., nine daily rainfalls in excess of 2.50 inches have been recorded in July since 1874, these stations showing the maxinum number. The most remarkable daily rainfalls shown by the records, with dates of occurrence, are: 12.00 at Lambertville, N. J., 16th, 1865; 10.00 at Union Point, Ga., 29th, 1887; 8.10 at White, Tenn., 8th, 1883; 8.10 at Philo, Ill., 8–9th, 1888; Morriston, Dak., 8.00, 22–23d, 1878; 8.00 Logan, Iowa, 10th, 1878.

As to hourly rainfalls amounting to or exceeding 1.00, the July records show quite a decided increase in their frequency over any month previously discussed. They seem to have occurred with greatest frequency in the vicinity of the fortieth parallel from the Missouri Valley eastward to the Atlantic. Some of the most remarkable falls on record are given in the following table:

Station.	Year.	Date.	Actual fall.	Duration.	Rate per hour.
			Inches.	*h. m.*	*Inches.*
Wooster, Ohio	1879	29	6.56	1 45	3.75
Gracey, Ohio	1888	9	7.00	2 00	3.50
Fort Barrancas, Fla	1884	16	7.30	4 45	1.54
Tucson, Ariz	1878	11	5.10	1 45	2.94
Logansport, Ind	1879	7	3.50	0 30	7.00
Sandusky, Ohio	1879	11	2.25	0 15	9.00
Huron, Dak	1885	26	1.30	0 10	7.80

Table showing for the month of July monthly rainfalls of 10 *inches, or more (in states where monthly rainfalls did not reach* 10 *inches the station reporting the maximum amount is given); rainfalls of* 2.50 *inches, or more, in any* 24 *consecutive hours; and rainfalls equaling or exceeding one inch in one hour.*

States and stations.	Rainfall of 10 inches, or more, per month.		Rainfall of 2.50 inches, or more, in 24 hours.			Rainfall equaling or exceeding one inch per hour.			
	Year.	Amt.	Year.	Day.	Amt.	Year.	Day.	Time.	Amt.
Alabama.		*Inches.*			*Inches*			*h. m.*	*Inches*
Eufaula	......	......	1887	27	2.65	......	......	......	......
Fort Deposit	......	......	1886	11	2.95	......	......	......	......
Greenville	......	......	1887	3	2.57	......	......	......	......
Mobile	1872	13.37	1872	3	2.55	1871	19	1 00	1.01
Do	1874	10.21	1872	10	3.69	1874	10	1 35	3.11
Do	1879	11.17	1873	21	5.73	1876	3	1 00	1.00
Do	......	......	1874	4	3.68	1878	20	0 30	1.15
Do	......	......	1874	10	3.38	1879	25	1 00	1.80
Do	......	......	......	......	......	1883	3	0 58	1.00
Do	......	......	......	......	......	1888	27	1 30	2.10

Table showing for the month of July, &c.—Continued.

States and stations.	Rainfall of 10 inches, or more, per month. Year.	Amt.	Rainfall of 2.50 inches, or more, in 24 hours. Year.	Day.	Amt.	Rainfall equaling or exceeding one inch per hour. Year.	Day.	Time.	Amt.
Alabama—Continued.		*Inches.*			*Inches*			*h. m.*	*Inches*
Montgomery			1882	12	2.53	1876	30	0 55	1.00
Do			1888	20	3.54	1877	19	0 55	1.35
Do						1885	26	1 02	1.64
Do						1885	31	0 55	1.08
Do						1888	20	1 00	1.62
Do						1888	20	0 30	0.65
Opelika	1887	20.18	1887	20	2.96				
Do			1887	27	5.70				
Do			1887	28	5.50				
Scottsborough			1884	28	3.10				
Selma			1886	27	3.20				
Arizona.									
Fort Apache						1882	23	1 15	1.20
Do						1885	22	1 10	1.20
Fort Grant	1887	9.00	1880	25	2.51	1879	8	1 05	1.21
Do						1887	3	1 45	1.63
Tucson			1878	11	5.10	1878	11	1 45	5.10
Arkansas.									
Forrest City			1887	21	3.00				
Fort Smith	1884	5.98							
Little Rock						1883	4	1 00	1.40
Do						1883	8	1 00	1.00
Do						1884	3	1 00	1.20
Do						1888	9	1 00	1.00
California.									
Campo	1878	2.32				1878	13	1 35	2.32
Colorado.									
Denver						1874	25	0 55	1.36
Do						1881	30	0 45	1.60
Las Animas			1886	24–25	3.36	1886	24	1 00	1.65
Do						1886	25	0 51	1.34
Pike's Peak	1875	8.13							
Connecticut.									
Canton	1863	12.72							
Colebrook			1874	4–5	2.64				
Middletown	1876	10.20	1876	30–31	5.75				
New Haven	1876	11.05	1876	30–31	7.00				
Do			1879	11–12	3.02				
Do			1883	28–29	3.62				
New London						1885	21	0 48	1.49
North Colebrook			1887	23–24	4.30				
Dakota.									
Deadwood						1872	27	0 45	1.16
Firesteel			1876	8	3.80				
Highmore			1888	28	2.70				
Huron						1882	29	2 00	2.06
Do						1884	21	0 45	1.05
Do						1885	26	0 10	1.30
Fort Meade						1888	1	1 00	1.40
Morriston	1878	10.20	1878	22–23	8.00				
Parkston						1887	1	0 50	1.45
Fort Pembina			1876	18–19	3.41				
Fort Randall	1878	11.85	1869	14–15	3.10				
Fort Ransom			1872	24	3.45	1872	7	0 55	2.05
Fort Sisseton						1879	21	1 10	1.92
Fort Sully			1871	31	6.45				
Do			1878	21–22	3.10				
Fort Totten			1877	26	2.68				
Fort Wadsworth						1875	8	0 45	1.00
Webster	1884	14.65	1884	2–3	4.84	1884	2–3	1 45	4.84
Do			1887	2–3	2.74	1884	4	1 05	1.10
Do						1885	19	0 55	2.21
Yankton			1879	15	3.11	1888	13	0 50	1.20
Yates			1888	1	2.70				
Delaware.									
Cape Henlopen	1885	3.40							
Dover			1874	4	2.54				
Milford			1877	27	2.80				
District of Columbia.									
Washington City	1886	10.63	1876	30	4.12	1878	30	1 00	1.00
Do			1878	29–30	5.80	1879	26	1 15	1.73
Do			1886	25–26	3.25				
Do			1888	9–10	2.98				
Florida.									
Fort Barrancas	1879	18.32	1879	16	3.09	1874	6	1 00	1.30
Do			1879	23	2.43				
Do	1880	11.03	1879	27	2.73	1879	23	0 55	2.43
Do	1884	11.80				1880	28	1 40	1.38
Do						1881	28	0 30	1.17
Do						1884	16	4 45	7.30
Biscayne	1877	13.60	1874	14	2.30	1874	2	2 00	2.10
Fort Brock	1882	10.44							
Cedar Keys	1881	11.86	1880	23	2.50	1885	30	1 00	1.44
Do	1882	10.33	1880	27–28	3.04	1886	17	1 00	1.00
Do	1886	11.72	1881	12	3.20				
Do			1882	4	2.56				
Do			1882	24	3.43				
Do			1885	15	4.54				
Daytona			1880	20	3.42	1874	21	1 00	1.70
Do						1880	16	0 40	1.60
Fernandina	1864	25.88	1884	2*	2.50				
Fort Meade	1888	10.17							
Jacksonville			1884	16	2.65	1881	18	1 15	1.09
Do			1885	16–17	2.75	1883	8	0 50	1.65
Do			1886	5–6	3.51	1886	6	0 40	3.49
Do			1888	2–3	3.47	1888	16	0 25	1.60
Key West			1872	8–9	4.00	1880	12	1 15	1.18
Do						1888	4	0 20	0.57
Do			1886	29–30	2.78	1888	16	0 15	0.54
Do						1888	27	0 55	1.11
Pensacola			1880	28	2.77				

Table showing for the month of July, &c.—Continued.

States and stations.	Rainfall of 10 inches, or more, per month. Year.	Amt.	Rainfall of 2.50 inches, or more, in 24 hours. Year.	Day.	Amt.	Rainfall equaling or exceeding one inch per hour. Year.	Day.	Time.	Amt.
Florida—Continued.		*Inches.*			*Inches*			*h. m.*	*Inches*
Saint Francis Barracks			1888	8	3.00				
Sanford	1886	10.21							
Sebastian			1888	21	2.55				
Tallahassee						1888	15	1 00	1.15
Titusville			1888	23–24	2.96	1887	29	0 42	1.00
Waldo	1886	14.54	1886	25	2.73				
Georgia.									
Albany			1885	24	3.60				
Andersonville			1884	27	2.80				
Athens	1887	15.93	1884	4	4.02				
Do			1887	27	2.70				
Do			1887	28	3.10				
Atlanta			1887	30	3.51				
Augusta			1885	11	2.70	1876	14	1 00	1.49
Do			1886	*	2.80	1881	20	1 00	1.18
Do			1887	29–30	3.55	1886	10	0 55	1.10
Bainbridge	1886	10.68	1886	1	4.15				
Do	1887	10.43	1887	27	4.20				
Camak	1887	13.46	1887	29	5.20				
Cartersville	1887	10.54							
Columbus	1887	12.59	1887	27	2.70				
Do			1887	28	3.10				
Do			1888	5	2.99				
Dahlonega	1874	10.30				1874	23	1 00	1.00
Eastman			1886	1	6.03				
Forsyth	1887	12.70	1874	11–12	3.00				
Fort Gaines			1887	27	2.80				
Gainesville			1887	28	3.10				
Griffin	1887	14.44	1887	28	3.58				
Do			1887	29	2.74				
Do			1888	25	2.90				
Macon			1888	19	2.50				
McPherson Barracks						1874	28	1 15	1.86
Do						1880	7	1 00	1.00
Milledgeville	1887	16.09							
Millen	1887	12.71	1887	24	2.50				
Newnan	1887	15.93	1887	28	5.69				
Do			1887	30	3.70				
Quitman	1878	12.40	1878	12	4.00	1874	2	0 55	1.00
Do			1882	3	3.40	1875	5	0 20	1.00
Do						1875	14	0 50	1.90
Saint Mary's			1877	21–22	4.30				
Savannah	1874	10.12	1872	28	3.00	1877	30	1 00	1.01
Do			1874	3	3.05	1879	5	0 35	1.03
Do			1876	24	3.52	1886	4	1 00	1.06
Do			1877	10	2.80				
Smithville	1884	11.85	1884	12	7.50				
Do	1887	15.01	1886	1	3.00				
Thomasville	1886	12.71	1883	22	2.80				
Do			1886	5	2.99				
Do			1887	31	2.78				
Toccoa	1887	11.66							
Union Point	1887	18.13	1887	29	10.00				
Do			1887	30	4.10				
Washington	1887	15.95	1887	29	6.30				
Do			1887	30	3.61				
West Point			1887	28	4.35				
Idaho.									
Lewiston	1880	1.87							
Illinois.									
Anna						1884	27	1 00	1.42
Augusta	1875	14.04	1875	†	3.87				
Do			1877	15–16	4.15				
Cairo			1871	10	2.73	1871	10	2 00	2.70
Do			1875	29–30	2.51	1871	12	0 40	1.01
Do						1877	29	1 05	2.09
Do						1880	19	0 45	1.72
Do						1883	16	0 45	1.09
Chicago			1878	25–26	4.14	1888	3	0 23	0.75
Do			1879	6–7	3.25				
Decatur	1875	12.48							
Dubois						1874	9	1 00	1.20
Havana			1875	31	3.00				
Do			1876	4	3.50				
Hennepin			1875	18	3.30				
Do			1875	28	3.70				
Do			1876	4	3.00				
Hinsdale			1879	8	3.75				
Louisville			1874	22–23	3.00	1878	1	2 00	5.00
Do			1875	10	2.50				
Do			1875	26	3.60				
Do			1878	1	5.00				
Do			1880	2	2.50				
Lyndon			1878	1	2.88				
McLeansborough						1882	29	1 30	1.65
Do						1886	26	1 00	1.00
Mahomet			1888	9	3.36				
Mount Sterling	1875	11.10	1875	31	3.40				
Do			1879	6–7	4.00				
Do			1879	9	4.30				
Pekin			1888	26	2.50	1888	26	1 00	2.20
Peoria			1860	1	4.13	1858	16	1 00	1.34
Do			1863	24	3.15	1888	8	0 30	1.10
Piatt			1888	8	4.68				
Philo			1888	8–9	8.10	1888	8	0 15	1.20
Riley			1878	11–12	4.26				
Springfield						1883	16	1 35	1.35
Wyanet			1875	16–17	3.41				
Do			1875	27	3.00				
Indiana.									
Connersville			1888	8–9	6.82				

Table showing for the month of July, &c.—Continued.

States and stations.	Rainfall of 10 inches, or more, per month.		Rainfall of 2.50 inches, or more, in 24 hours.			Rainfall equaling or exceeding one inch per hour.			
	Year.	Amt.	Year.	Day.	Amt.	Year.	Day.	Time.	Amt.
Indiana—Continued.		*Inches.*			*Inches*			*h. m.*	*Inches*
Fort Wayne	1878	10.60							
Huntington			1888	9	2.65				
Indianapolis	1872	11.00	1871	16	2.81	1871	16	0 45	1.75
Do.	1873	11.28	1872	17	3.71	1872	13	0 42	1.52
Do.	1875	13.12	1873	2	3.73	1873	4	1 05	1.18
Do.			1876	12	2.70	1875	4	1 00	1.34
Do.						1875	15	1 00	1.25
Do.						1875	27	0 30	1.09
Do.						1876	12	0 25	2.40
Do.						1883	12	0 55	1.20
Do.						1886	9	1 00	1.10
Jeffersonville			1888	9	2.71	1885	30	0 55	1.14
Kokoma	1875	11.30	1875	†	3.00				
Lafayette			1888	9	3.40				
Logansport			1879	7	3.50	1879	7	0 30	3.50
Mauzy			1888	9	3.00				
New Corydon			1878	11-12	5.05				
Do.			1878	29	3.71				
Do.			1880	27	2.64				
New Harmony	1875	12.48							
Rising Sun			1874	27	4.45				
Do.			1878	11	2.57				
Saint Meinrad's Abbey			1875	27-28	2.70				
Do.			1878	29	5.30				
Salem						1888	28	1 20	2.41
Spiceland	1875	10.50							
Vevay						1888	28	0 45	1.80
Indian Territory.									
FortArbuckle			1867	12-13	2.60	1869	25	3 00	3.00
Do.			1869	25	3.00				
Fort Gibson	1875	11.89	1875	10-12	5.40				
Fort Sill			1870	11	3.78	1870	25	0 30	1.13
Iowa.									
Afton			1874	22	2.80	1875	25	0 50	1.00
Do.			1875	1	2.60				
Do.			1876	3-4	3.95				
Albion			1886	6	2.60				
Amana	1876	10.27	1881	10	4.14	1878	31	0 15	1.56
Do.						1885	25	0 45	1.68
Ames	1881	16.31	1881	10	4.55	1877	31	1 30	1.91
Do.			1881	11	5.35	1883	4	1 45	4.54
Do.			1883	4	4.54				
Boonsborough			1877	27	2.75	1877	31	2 00	2.35
Byron Township	1876	10.30	1876	4-5	3.40				
Do.			1876	14	3.30				
Clinton			1877	7	2.74	1882	9	0 45	1.31
Do.			1879	9	3.00	1888	21	0 55	1.15
Cresco	1878	10.92	1883	21	4.30	1876	17	1 15	1.85
Do.			1883	23	2.85	1881	21	1 00	2.18
Do.			1888	3	2.70	1883	3	1 15	1.25
Do.						1883	21	1 00	4.30
Cromwell			1888	4-5	6.50				
Davenport			1875	27	2.86	1874	8	0 56	1.00
Do.			1879	9	3.11	1880	4	1 15	1.20
Do.			1888	8-9	2.82	1882	9	1 10	1.17
Do.						1887	8	0 50	1.08
Do.						1888	25	0 45	1.09
Des Moines			1874	20-21	3.50	1880	8	1 00	1.00
Do.			1881	9-10	3.36	1881	9	1 00	1.00
Denmark			1888	26-27	4.81	1883	4	1 00	1.35
Do.						1888	26-7	2 00	4.81
Dubuque			1876	4-5	4.55	1876	5	1 00	1.00
Do.			1879	6-7	3.39	1881	7	1 00	2.17
Do.			1879	8-9	2.52				
Do.			1881	9-10	3.42				
Dysart	1880	10.00	1881	7	3.40	1881	11	5 00	6.20
Do.			1881	10	2.60				
Elkader						1885	26	1 00	1.25
Do.						1887	2	1 00	1.00
Flemington						1881	12	1 30	2.00
Do.						1881	16	0 45	1.20
Granville			1883	22-23	3.04	1883	20	1 00	1.35
Grinnell			1888	8	2.55				
Guttenburg	1883	10.01	1878	11	5.45	1883	20	1 00	1.75
Do.			1883	22-23	3.58	1884	23	1 00	1.49
Hamlin			1881	9-10	3.50				
Do.			1884	17	2.90				
Hampton			1888	30	3.16				
Independence	1876	11.92							
Do.	1880	10.40							
Keokuk			1872	22	4.34	1872	22	2 15	4.20
Do.			1875	31	4.31	1876	4	1 30	2.00
Do.			1876	4	5.06				
Do.			1877	26	2.54				
Logan	1878	10.61	1878	10	8.00				
Do.	1884	13.00							
Monticello	1876	10.45	1876	4-5	3.50	1888	3	0 45	1.29
Do.	1883	10.93	1879	8-9	5.60				
Do.			1883	14	2.84				
Do.			1888	3-4	2.86				
Nashua	1881	17.36	1881	9	7.75	1882	3	0 30	2.00
Do.	1883	10.88	1881	10	5.20				
Do.	1885	10.80	1887	30	4.09				
Newton			1881	10	3.15				
Osceola			1888	4	4.75				
Oskaloosa						1887	1	1 00	1.08
Smithland						1888	7	0 40	1.00
Tabor	1878	10.46	1878	9-10	3.00	1878	19	1 13	1.76
Kansas.									
Atchison			1884	12-13	3.20				
Baxter Springs	1875	15.30							

Table showing for the month of July, &c.—Continued.

States and stations.	Rainfall of 10 inches, or more, per month.		Rainfall of 2.50 inches, or more, in 24 hours.			Rainfall equaling or exceeding one inch per hour.			
	Year.	Amt.	Year.	Day.	Amt.	Year.	Day.	Time.	Amt.
Kansas—Continued.		*Inches.*			*Inches*			*h. m.*	*Inches*
Belleville			1876	16	2.60				
Do.			1876	23	4.00				
Dodge City			1884	16	3.13	1886	23	1 20	1.22
Do.						1888	8	1 00	1.00
Elko			1888	16	3.00				
Emporia	1885	10.26							
Gorham			1886	23-24	6.50				
Gove			1888	2	4.00				
Greeley			1888	17	2.97				
Hays, Fort			1876	13	2.70				
Do.			1877	27	3.30				
Holton						1876	9	1 00	1.00
Independence	1875	11.06	1877	18	3.37				
Fort Larned	1863	10.29	1865	17-18	2.50	1862	8	0 30	1.00
Do.			1874	15	5.60	1874	15	4 00	5.60
Do.						1875	29	2 00	2.06
Lawrence			1878	24	2.60				
Leavenworth			1872	8	3.55	1876	28	1 00	1.23
Do.			1875	26-27	2.92	1880	30	0 43	1.09
Do.			1880	2	3.62				
Do.			1884	13-14	4.34				
Do.			1884	29-30	3.30				
Fort Leavenworth	1872	10.06				1870	12	1 30	3.19
Le Roy	1875	12.56				1875	30	2 30	5.30
Manhattan			1878	24	6.10				
Do.			1888	15-16	3.18				
Morse			1888	8-9	3.00				
Ninnescah			1886	23-24	7.00				
Pence			1888	16	3.00				
Pontiac			1877	17-18	2.80				
Fort Riley						1867	4	1 00	1.16
Do.						1868	12	1 00	1.00
Do.						1871	2	1 00	1.43
Do.						1875	9	1 00	2.12
Do.						1882	11	0 30	1.34
Fort Scott	1884	10.76	1881	12	3.08				
Tribune			1888	17	2.97				
Fort Wallace	1880	12.59	1880	19-20	3.90	1879	28	1 00	1.60
Do.			1880	29	3.84	1880	29	3 00	3.84
Yates Centre	1885	11.65	1885	2	3.87				
Kentucky.									
Lexington			1888	9-10	2.90				
Louisville	1875	16.46	1875	22	2.30	1878	21	0 55	1.73
Do.			1875	29-30	3.42	1883	16	2 00	2.00
Louisiana.									
Amite City			1883	3	2.50				
Ashton Plantation			1885		3.00				
Fort Pike	1843	18.22							
Liberty Hill	1887	11.15	1887	6	2.90				
New Orleans	1874	12.93	1874	3-4	7.52	1871	31	0 40	1.16
Do.	1880	11.22	1878	21	2.74	1881	3	1 00	2.48
Do.			1881	3	3.25	1882	6	0 55	1.30
Shreveport	1880	10.97	1874	9	3.36	1878	6	0 55	1.25
Do.	1882	11.38	187[illegible]	23	2.56	1880	15	1 00	1.30
Do.			[illegible]80	27	5.00	1888	18	0 15	0.26
Do.			1882	18	2.83	1888	18	0 30	0.56
Whiteville			1883	22	2.88				
Maine.									
Cornish						1884	23	1 00	1.05
Eastport	1883	9.07							
Fort Preble			1879	26	3.02				
Maryland.									
Baltimore			1875	15	2.70	1877	24	0 55	1.28
Do.			1876	30	3.14	1884	11	1 43	3.75
Do.			1880	20	3.71	1884	31	1 15	1.40
Do.			1884	11	3.75				
Do.			1887	21	2.77				
Fallston	1886	10.75							
Fort Foote			1878	28-29	3.90				
Fort McHenry			1875	15-16	2.82	1884	11	1 45	3.54
Do.			1884	11	3.54				
Do.			1886	15	3.10				
Sandy Springs			1878	19	2.84	1878	19	1 00	2.00
Do.						1880	5	2 30	5.00
Woodlawn			1874	11	4.45				
Massachusetts.									
Amherst	1874	11.58				1879	16	0 20	2.00
Boston						1882	19	0 40	1.27
Deerfield	1887	10.66							
Fort Independence	1875	11.50	1875	5	3.00				
Do.			1875	6	3.00				
Do.			1875	23	3.10				
New Bedford			1878	17-18	4.44				
Do.			1888	22	3.16				
Northampton	1874	10.13	1874	4-5	3.60				
Rowe			1881	25	3.00	1878	4	1 00	1.70
Somerset			1875	23	2.80				
Vineyard Haven			1888	22	3.60	1888	22	1 00	1.04
Williamstown	1887	10.82	1887	23	3.52	1875	10	0 50	1.43
Woods Holl			1888	22	4.41				
Worcester			1876	30-31	4.61				
Michigan.									
Detroit			1878	31	2.48				
Escanaba						1872	2	0 30	1.65
Fort Wayne						1876	20	0 30	1.01
Grand Haven			1874	25	3.42	1885	19	1 00	1.15
Lansing			1883	21	3.40	1880	14	0 55	1.12
Do.						1883	21	1 00	3.40
Do.						1888	8	0 45	0.93
Manistee						1888	31	1 10	1.16
Marquette			1873	15	4.13	1877	7	0 45	1.44

Table showing for the month of July, &c.—Continued.

States and stations.	Rainfall of 10 inches, or more, per month.		Rainfall of 2.50 inches, or more, in 24 hours.			Rainfall equaling or exceeding one inch per hour.			
	Year.	Amt.	Year.	Day.	Amt.	Year.	Day.	Time.	Amt.
Michigan—Continued.		*Inches.*			*Inches*			h. m.	*Inches*
Marshall	.....	.....	.....	.....	.....	1884	28	0 30	1.29
Niles	.....	.....	1879	6-7	2.55	.....	.....	.....	.....
Northport	1884	10.75	1884	3	2.75	.....	.....	.....	.....
Petersburg	.....	.....	.....	.....	.....	1888	31	0 30	1.20
Port Huron	.....	.....	.....	.....	.....	1888	23	0 40	0.79
Woodwere	.....	.....	.....	.....	.....	1878	31	0 55	1.22
Do	.....	.....	.....	.....	.....	1879	10	1 05	1.25
Minnesota.									
Duluth	1879	10.42	.....	.....	.....	.....	.....	.....	.....
Forest City	1858	16.91	.....	.....	.....	.....	.....	.....	.....
Lake Hook	1872	21.86	.....	.....	.....	.....	.....	.....	.....
Le Sueur	.....	.....	.....	.....	.....	1888	1	1 30	2.00
Moorhead	.....	.....	.....	.....	.....	1883	19	0 50	1.63
Do	.....	.....	.....	.....	.....	1888	15	0 45	0.80
Ortonville	.....	.....	1888	21	2.63	.....	.....	.....	.....
Fort Ripley	1850	11.92	1867	18	7.50	1873	14	1 30	1.72
Do	1867	10.90	1868	30	2.55	1875	8	2 15	2.40
Saint Paul	.....	.....	1879	2-3	5.01	1884	29	0 21	1.03
Do	.....	.....	.....	.....	.....	1888	30	0 10	0.30
Saint Vincent	.....	.....	1876	18-19	2.51	.....	.....	.....	.....
Fort Snelling	.....	.....	1879	2-3	6.60	.....	.....	.....	.....
Mississippi.									
Aberdeen	.....	.....	1884	28	2.99	.....	.....	.....	.....
Columbus	.....	.....	1884	28	4.30	.....	.....	.....	.....
Do	.....	.....	1888	19	2.90	.....	.....	.....	.....
Fayette	.....	.....	1874	4-5	2.50	1876	19	0 50	2.10
Granada	.....	.....	1886	27	2.50	1870	3	1 00	1.57
Hernando	.....	.....	1884	28	2.50	.....	.....	.....	.....
Do	.....	.....	1888	19	2.60	.....	.....	.....	.....
Holly Springs	.....	.....	1873	8	3.00	.....	.....	.....	.....
Lake	.....	.....	1886	26	3.70	.....	.....	.....	.....
Natches	.....	.....	1885	26	2.85	.....	.....	.....	.....
Okaloona	.....	.....	1888	18	3.20	.....	.....	.....	.....
Palo Alto	.....	.....	1888	17	2.56	.....	.....	.....	.....
University	.....	.....	.....	.....	.....	1888	17	0 39	0.92
Vicksburg	1882	10.19	1874	4-5	2.73	1888	17	0 50	1.35
Missouri.									
Herman	1875	11.84	1875	28	2.92	.....	.....	.....	.....
Kirksville	1888	10.48	.....	.....	.....	.....	.....	.....	.....
Lamar	.....	.....	1885	2-3	2.44	.....	.....	.....	.....
Saint Louis	1875	10.00	1845	2	2.67	1845	18	0 45	1.37
Do	.....	.....	1849	6	3.30	1847	25	1 30	1.76
Do	.....	.....	1858	10	4.18	1848	5	0 15	1.00
Do	.....	.....	1874	21-22	2.70	1852	1	1 00	1.35
Do	.....	.....	.....	.....	.....	1859	2	1 00	1.80
Do	.....	.....	.....	.....	.....	1863	5	1 00	1.53
Montana.									
Fort Assinaboine	1884	9.67	1884	16	3.27	.....	.....	.....	.....
Camp Cooke	.....	.....	.....	.....	.....	1868	1	1 05	1.56
Fort Missoula	.....	.....	.....	.....	.....	1875	8	1 00	1.67
Nebraska.									
Brownville	.....	.....	1886	31	3.00	1886	31	1 20	3.00
Clear Creek	.....	.....	1880	7	4.50	1876	25	0 45	1.06
Do	.....	.....	.....	.....	.....	1880	7	1 27	4.50
Do	.....	.....	.....	.....	.....	1881	10	0 35	1.13
Do	.....	.....	.....	.....	.....	1883	4	0 55	1.37
De Soto	.....	.....	1881	9-10	2.80	.....	.....	.....	.....
Emerson	1875	14.25	1875	26-27	3.85	.....	.....	.....	.....
Genoa	.....	.....	1888	13	2.80	.....	.....	.....	.....
Howard	1875	10.21	.....	.....	.....	.....	.....	.....	.....
Lincoln	.....	.....	1888	26	3.17	.....	.....	.....	.....
Marquette	.....	.....	1884	21	2.70	.....	.....	.....	.....
Fort McPherson	.....	.....	.....	.....	.....	1878	8	1 30	2.50
Omaha	1875	10.01	.....	.....	.....	.....	.....	.....	.....
Do	.....	.....	1869	16	3.20	1871	28	1 00	1.00
Do	.....	.....	1871	27-28	4.35	1880	7	1 00	1.00
Do	.....	.....	1880	7	2.80	1884	3	1 00	1.06
Do	.....	.....	1885	23	2.57	1884	18	1 00	1.00
Do	.....	.....	1885	25	2.74	.....	.....	.....	.....
Omaha Barracks	1869	17.01	1869	12	2.50	1869	12	2 00	2.50
Plattsmouth	.....	.....	1878	9-10	4.81	.....	.....	.....	.....
Red Cloud	.....	.....	1874	8	2.50	.....	.....	.....	.....
Red Willow	.....	.....	1884	12-13	2.50	.....	.....	.....	.....
Camp Sheridan	.....	.....	.....	.....	.....	1878	10	1 00	1.14
Sidney Barracks	.....	.....	1875	19	4.00	1875	19	1 30	4.00
Valentine	.....	.....	.....	.....	.....	1888	7	2 10	2.32
Yutan	.....	.....	.....	.....	.....	1884	27	0 30	1.30
Nevada.									
Winnemucca	1886	0.61	.....	.....	.....	.....	.....	.....	.....
New Hampshire.									
Auburn	.....	.....	1874	4	3.00	1880	16	1 00	1.50
Dunbarton	1872	10.87	.....	.....	.....	1880	29	0 55	1.00
Do	.....	.....	.....	.....	.....	1880	26	0 50	1.80
Do	.....	.....	.....	.....	.....	1880	27	0 20	1.20
Manchester	.....	.....	1887	23	2.60	.....	a	.....	.....
Do	.....	.....	1887	23-24	2.57	.....	.....	.....	.....
Mount Washington	1873	13.54	1888	12-13	2.69	.....	.....	.....	.....
Do	1876	14.51	.....	.....	.....	.....	.....	.....	.....
Do	1877	11.27	.....	.....	.....	.....	.....	.....	.....
Do	1878	11.00	.....	.....	.....	.....	.....	.....	.....
Do	1879	10.23	.....	.....	.....	.....	.....	.....	.....
Do	1882	10.03	.....	.....	.....	.....	.....	.....	.....
Do	1883	11.14	.....	.....	.....	.....	.....	.....	.....
Do	1884	23.90	.....	.....	.....	.....	.....	.....	.....
Do	1885	11.34	.....	.....	.....	.....	.....	.....	.....
Do	1887	15.16	.....	.....	.....	.....	.....	.....	.....
New Jersey.									
Atlantic City	.....	.....	1878	29-30	2.51	.....	.....	.....	.....
Barnegat	.....	.....	1878	30	3.42	.....	.....	.....	.....
Clayton	.....	.....	1888	9-10	2.76	.....	.....	.....	.....
Lambertville	1865	15.23	1847	12	3.12	.....	.....	.....	.....

Table showing for the month of July, &c.—Continued.

States and stations.	Rainfall of 10 inches, or more, per month.		Rainfall of 2.50 inches, or more, in 24 hours.			Rainfall equaling or exceeding one inch per hour.			
	Year.	Amt.	Year.	Day.	Amt.	Year.	Day.	Time.	Amt.
New Jersey—Continued.		*Inches.*			*Inches*			h. m.	*Inches*
Lambertville	.....	.....	1849	20-21	3.24	.....	.....	.....	.....
Do	.....	.....	1850	18-19	4.70	.....	.....	.....	.....
Do	.....	.....	1863	8	2.68	.....	.....	.....	.....
Do	.....	.....	1865	16	12.00	.....	.....	.....	.....
Moorestown	.....	.....	1888	19	3.13	.....	.....	.....	.....
Ocean City	.....	.....	1888	9-10	2.50	.....	.....	.....	.....
Oceanic	.....	.....	1888	19	3.78	.....	.....	.....	.....
Rancocas	.....	.....	1888	19	2.93	.....	.....	.....	.....
New Mexico.									
Las Vegas	.....	.....	.....	.....	.....	1875	10	0 30	1.20
Santa Fé	1875	6.91	1876	15-16	2.50	1876	14	0 45	1.00
Do	.....	.....	.....	.....	.....	1876	15	1 00	1.00
New York.									
Albany	.....	.....	.....	.....	.....	1876	10	0 10	1.22
Do	.....	.....	.....	.....	.....	1888	5	0 13	1.00
Argyle	.....	.....	1876	10	2.70	.....	.....	.....	.....
Buffalo	.....	.....	1873	17	2.70	1873	17	1 05	2.00
Do	.....	.....	.....	.....	.....	1876	25	0 42	1.04
Do	.....	.....	.....	.....	.....	1878	10	0 30	1.00
Flushing	1880	10.10	1880	12	4.15	1880	12	2 00	4.15
Moriches	.....	.....	1875	16	3.00	.....	.....	.....	.....
New York City	.....	.....	.....	.....	.....	1871	16	0 20	1.00
Do	.....	.....	.....	.....	.....	1872	30	1 00	1.45
Do	.....	.....	.....	.....	.....	1880	13	0 15	1.00
Fort Niagara	.....	.....	.....	.....	.....	1879	11	1 30	2.00
North Volney	.....	.....	1874	4	3.15	.....	.....	.....	.....
Oneida	1874	12.61	1874	4	5.24	.....	.....	.....	.....
Oswego	.....	.....	1874	4	3.14	.....	.....	.....	.....
Do	.....	.....	1874	28	3.05	.....	.....	.....	.....
Do	.....	.....	1877	1	3.57	.....	.....	.....	.....
Stapleton	.....	.....	1876	30	2.83	.....	.....	.....	.....
White Plains	.....	.....	1874	11-12	2.85	.....	.....	.....	.....
North Carolina.									
Asheville	1874	11.20	.....	.....	.....	.....	.....	.....	.....
Brevard	1884	10.28	.....	.....	.....	.....	.....	.....	.....
Cape Lookout	.....	.....	.....	.....	.....	1878	14	1 05	1.26
Do	.....	.....	.....	.....	.....	1878	30	1 00	1.80
Charlotte	.....	.....	1879	30	4.24	1879	30	0 50	1.50
Do	.....	.....	1884	11	3.10	1880	5	1 00	1.60
Do	.....	.....	1886	1	3.85	1884	18	1 15	1.49
Do	.....	.....	1886	14-15	2.59	.....	.....	.....	.....
Elsworth	1880	10.87	.....	.....	.....	.....	.....	.....	.....
Fayetteville	1879	17.50	1879	27	3.50	.....	.....	.....	.....
Do	.....	.....	1879	28	6.50	.....	.....	.....	.....
Hatteras	1884	10.51	1877	20	3.42	1876	6	1 30	1.68
Do	.....	.....	1880	21	3.12	1878	13	1 30	2.10
Do	.....	.....	1882	16-17	2.54	1880	21	3 00	3.00
Do	.....	.....	1884	11	4.16	.....	.....	.....	.....
Do	.....	.....	1886	1	4.04	.....	.....	.....	.....
Do	.....	.....	1888	20-21	2.51	.....	.....	.....	.....
Fort Johnston	1874	10.00	1872	29	4.00	.....	.....	.....	.....
Kitty Hawk	1884	10.76	.....	.....	.....	.....	.....	.....	.....
Lumberton	.....	.....	1885	27	2.51	.....	.....	.....	.....
Do	.....	.....	1886	1	3.18	.....	.....	.....	.....
Fort Macon	.....	.....	1874	29	3.00	.....	.....	.....	.....
Murphy	.....	.....	.....	.....	.....	1875	1	1 00	1.30
New Berne	.....	.....	1885	26	2.99	.....	.....	.....	.....
Raleigh	.....	.....	1888	30	3.70	1888	30	3 15	3.70
Statesville	.....	.....	1886	1	2.77	.....	.....	.....	.....
Southport	1881	10.65	1879	24	4.98	.....	.....	.....	.....
Do	1886	11.99	.....	.....	.....	.....	.....	.....	.....
Wadesborough	.....	.....	1884	.....	3.25	.....	.....	.....	.....
Weldon	1886	15.33	1885	28	2.87	1875	7	0 45	2.00
Do	.....	.....	1886	4	3.15	.....	.....	.....	.....
Do	.....	.....	1886	5	4.75	.....	.....	.....	.....
Wilmington	1881	12.40	1874	2	2.92	1880	27	0 51	1.10
Do	1886	21.12	1877	21	3.90	1881	1	1 00	2.10
Do	.....	.....	1880	23	3.45	1882	25	1 00	1.01
Do	.....	.....	1881	1	4.48	1885	11	1 00	1.10
Do	.....	.....	1881	27	2.97	1886	6	1 00	1.30
Do	.....	.....	1884	31	3.51	1886	15	1 00	1.75
Do	.....	.....	1886	5	2.73	.....	.....	.....	.....
Do	.....	.....	1886	15	7.33	.....	.....	.....	.....
Do	.....	.....	1887	3	3.45	.....	.....	.....	.....
Ohio.									
Bethel	1875	10.00	.....	.....	.....	.....	.....	.....	.....
Caledonia	.....	.....	1888	9	2.75	.....	.....	.....	.....
Carthagena	1875	12.16	.....	.....	.....	.....	.....	.....	.....
Chilicoth	1875	10.70	.....	.....	.....	.....	.....	.....	.....
Cleveland	.....	.....	1878	8-9	2.61	1885	3	0 42	1.02
Do	.....	.....	1879	10-11	3.86	.....	.....	.....	.....
Do	.....	.....	1880	9	2.51	.....	.....	.....	.....
College Hill	1875	12.00	1875	22	2.50	1875	3	1 00	1.00
Do	.....	.....	1878	2	2.50	1875	31	1 00	1.50
Do	.....	.....	.....	.....	.....	1878	13	1 00	1.00
Columbus	.....	.....	1886	30	2.80	1886	30	1 00	2.80
Grace	.....	.....	1888	7-8	5.00	1888	9	2 00	7.00
Do	.....	.....	1888	9	7.00	.....	.....	.....	.....
Garrettsville	.....	.....	.....	.....	.....	1885	24	1 30	2.21
Hasson	.....	.....	1888	17	2.75	.....	.....	.....	.....
Hiram	.....	.....	.....	.....	.....	1885	24	2 00	2.31
Hudson	.....	.....	1878	26	3.00	.....	.....	.....	.....
Jacksonborough	1875	12.40	.....	.....	.....	.....	.....	.....	.....
Kenton	1875	13.43	.....	.....	.....	.....	.....	.....	.....
Marietta	1888	10.48	.....	.....	.....	.....	.....	.....	.....
Mount Auburn	1875	11.45	.....	.....	.....	.....	.....	.....	.....
Newcomerstown	.....	.....	1888	8-9	4.04	.....	.....	.....	.....
North Lewisburg	.....	.....	.....	.....	.....	1879	10	0 45	1.00
Portsmouth	.....	.....	1837	27	4.20	1870	1	3 00	3.10
Do	.....	.....	1843	11	3.20	1870	7	0 30	1.10
Do	.....	.....	1843	30	2.60	1888	7	1 00	1.62

Table showing for the month of July, &c.—Continued.

States and stations.	Rainfall of 10 inches, or more, per month.		Rainfall of 2.50 inches, or more, in 24 hours.			Rainfall equaling or exceeding one inch per hour.			
	Year.	Amt.	Year.	Day.	Amt.	Year.	Day.	Time.	Amt.
Ohio—Continued.		*Inches.*			*Inches*			h. m.	*Inches*
Portsmouth	.....	.....	1870	1	3.10	.....	...	.....	.....
Do	.....	.....	1874	26-27	2.57	.....	...	.....	.....
Ringgold	1875	10.50	.....	.....	.....	.....	...	.....	.....
Ruggles	.....	.....	1878	26	3.20	.....	...	.....	.....
Do	.....	.....	1880	10-11	4.00	.....	...	.....	.....
Sandusky	.....	.....	1879	11-12	2.53	1879	11	0 15	2.25
Do	.....	.....	.....	.....	.....	1886	23	0 15	0.54
Urbana	.....	.....	1876	14	2.51	1879	10	0 25	2.00
West Milton	.....	.....	1888	9	2.75	.....	...	.....	.....
Wooster	1879	10.48	1879	29	6.56	1879	29	1 43	6.56
Do	.....	.....	1888	8	2.67	1888	8	0 42	1.71
Oregon.									
Astoria	1886	2.58	.....	.....	.....	.....	...	.....	.....
Pennsylvania.									
Alleghany Arsl	.....	.....	.....	.....	.....	1865	8	1 00	1.15
Bethlehem	.....	.....	1887	5	3.70	.....	...	.....	.....
Carlisle	.....	.....	1874†	11	2.70	1870	12	1 30	1.92
Do	.....	.....	1875	15	2.50	.....	...	.....	.....
Erie	.....	.....	.....	.....	.....	1882	18	0 35	1.32
Do	.....	.....	.....	.....	.....	1888	18	0 35	1.00
Fallsington	1880	12.31	.....	.....	.....	.....	...	.....	.....
Franklin	.....	.....	1888	31	2.58	.....	...	.....	.....
Germantown	1887	10.84	1887	31	4.45	.....	...	.....	.....
Hulmeville	1880	11.15	1877	20	3.14	1877	30	0 35	1.15
Do	.....	.....	1879	26	4.00	1879	26	1 50	3.50
Do	.....	.....	1880	5-6	4.73	.....	...	.....	.....
Irwin	.....	.....	1879	26	7.00	.....	...	.....	.....
Litchfield	.....	.....	.....	.....	.....	1879	23	0 40	1.00
Newtown	.....	.....	.....	.....	.....	1839	22	1 00	1.21
Philadelphia	.....	.....	1876	30	2.42	1876	10	1 00	1.25
Do	.....	.....	1887	23	2.75	1878	12	1 00	1.27
Do	.....	.....	.....	.....	.....	1887	23	1 00	2.25
Philipsburg	.....	.....	.....	.....	.....	1887	26	0 23	1.00
Pittsburg	.....	.....	1874	26-27	3.40	1874	7	0 30	1.01
Do	.....	.....	1878	4	2.80	1874	26	1 10	2.24
Do	.....	.....	1887	20-21	3.85	1876	20	0 30	1.08
Do	.....	.....	.....	.....	.....	1878	4	1 55	2.50
Do	.....	.....	.....	.....	.....	1879	29	1 00	1.00
Do	.....	.....	.....	.....	.....	1883	6	1 00	1.11
Do	.....	.....	.....	.....	.....	1886	26	0 34	1.50
Do	.....	.....	.....	.....	.....	1887	9	0 40	1.25
Do	.....	.....	.....	.....	.....	1887	20	2 45	3.00
Do	.....	.....	.....	.....	.....	1887	31	1 00	1.00
Quakertown	.....	.....	1887	5	3.20	.....	...	.....	.....
Reading	.....	.....	1874	9-10	2.50	.....	...	.....	.....
Do	.....	.....	1887	31	2.50	.....	...	.....	.....
Turnantum	.....	.....	1874	26	4.50	.....	...	.....	.....
Tioga	.....	.....	.....	.....	.....	1876	18	1 20	2.00
Wellsborough	1880	12.30	1880	14	2.60	1880	2	1 30	1.64
Do	1882	10.57	1884	24-25	2.95	1880	14	1 45	2.60
Do	1883	10.24	1887	23	3.00	1880	16	0 25	1.78
Do	.....	.....	.....	.....	.....	1881	25	1 05	1.15
Do	.....	.....	.....	.....	.....	1883	14	0 30	1.26
Do	.....	.....	.....	.....	.....	1887	22	1 45	2.10
West Chester	1887	11.27	.....	.....	.....	.....	...	.....	.....
Rhode Island.									
Block Island	1887	7.52	1887	9-10	3.40	.....	...	.....	.....
South Carolina.									
Aiken	1883	10.47	.....	.....	.....	.....	...	.....	.....
Anderson	.....	.....	1886	1	2.53	.....	...	.....	.....
Batesburg	1887	11.19	1886	1	3.25	.....	...	.....	.....
Do	.....	.....	1887	20	2.97	.....	...	.....	.....
Blackville	1887	13.62	1886	1	2.53	.....	...	.....	.....
Do	.....	.....	1888	20	2.80	.....	...	.....	.....
Charleston	1874	13.74	1874	3	2.81	1873	19	0 31	1.15
Do	1876	11.26	1874	12-13	2.90	1878	14	3 30	5.14
Do	1877	10.31	1876	16	4.87	1880	12	1 00	2.04
Do	1878	12.10	1877	20-21	2.68	1884	21	1 00†	2.24
Do	.....	.....	1877	22	3.92	1888	29	0 45	1.10
Do	.....	.....	1878	14	5.14	.....	...	.....	.....
Do	.....	.....	1879	13-14	3.08	.....	...	.....	.....
Do	.....	.....	1881	1-2	3.80	.....	...	.....	.....
Do	.....	.....	1888	29-30	4.27	.....	...	.....	.....
Cheraw	.....	.....	1884	11	3.03	.....	...	.....	.....
Chester	.....	.....	1886	1	3.00	.....	...	.....	.....
Columbia	.....	.....	1886	1	3.88	1872	21	1 15	2.40
Do	.....	.....	.....	.....	.....	1872	14	1 00	1.00
Florence	.....	.....	1884	4	2.58	.....	...	.....	.....
Goldsborough	.....	.....	1885	28	3.27	.....	...	.....	.....
Do	.....	.....	1887	4	3.10	.....	...	.....	.....
Hardeeville	.....	.....	1885	4	2.52	.....	...	.....	.....
Jacksonborough	1884	11.28	1884	3	2.65	.....	...	.....	.....
Do	.....	.....	1884	12	2.55	.....	...	.....	.....
Kingstree	.....	.....	1886	1	3.39	.....	...	.....	.....
Fort Moultrie	.....	.....	1860	27	3.22	.....	...	.....	.....
Saint George's	.....	.....	1884	15	3.07	.....	...	.....	.....
Spartanburg	.....	.....	1886	1	2.53	.....	...	.....	.....
Do	.....	.....	1888	19	3.50	.....	...	.....	.....
Yemassee	1887	12.03	1884	12	3.00	.....	...	.....	.....
Tennessee.									
Austin	1880	10.13	1880	2	3.84	.....	...	.....	.....
Chattanooga	.....	.....	.....	.....	.....	1880	15	1 00	1.00
Knoxville	.....	.....	1884	31	3.00	1875	7	0 55	1.05
Do	.....	.....	.....	.....	.....	1878	21	0 40	1.21
Do	.....	.....	.....	.....	.....	1882	27	0 45	1.98
Memphis	.....	.....	1886	26	3.67	1876	21	1 00	1.00
Nashville	.....	.....	1878	8	2.99	1876	21	0 41	1.07
Do	.....	.....	1879	24-25	5.09	1878	8	0 46	2.90
Do	.....	.....	.....	.....	.....	1879	25	0 59	1.42
White	1885	28.11	1883	4	3.50	.....	...	.....	.....
Do	.....	.....	1883	6	5.01	.....	...	.....	.....

Table showing for the month of July, &c.—Continued.

States and stations.	Rainfall of 10 inches, or more, per month.		Rainfall of 2.50 inches, or more, in 24 hours.			Rainfall equaling or exceeding one inch per hour.			
	Year.	Amt.	Year.	Day.	Amt.	Year.	Day.	Time.	Amt.
Tennessee—Continued.		*Inches.*			*Inches*			h. m.	*Inches*
White	.....	.....	1883	8	8.10	.....	...	.....	.....
Do	.....	.....	1883	25	5.10	.....	...	.....	.....
Texas.									
Austin	.....	.....	1885	6	2.64	.....	...	.....	.....
Brownsville	.....	.....	1880	23	2.80	1878	19	0 55	1.02
Do	.....	.....	1886	4-5	3.16	.....	...	.....	.....
Clarksville	.....	.....	.....	.....	.....	1874	9	1 00	2.25
Do	.....	.....	.....	.....	.....	1875	31	4 00	4.00
Do	.....	.....	.....	.....	.....	1882	29	1 30	1.50
Coleman	.....	.....	1876	27	2.98	.....	...	.....	.....
Columbia	.....	.....	1887	2	2.50	.....	...	.....	.....
Do	.....	.....	1888	4	3.04	.....	...	.....	.....
Fort Concho	1880	10.26	1880	21	2.90	.....	...	.....	.....
Do	.....	.....	1880	29	2.30	.....	...	.....	.....
Corsicana	.....	.....	.....	.....	.....	1888	2	1 30	1.43
Dallas	.....	.....	1887	5	3.80	.....	...	.....	.....
Fort Davis	1880	16.11	1880	22-23	2.94	1880	6	1 00	1.33
Do	.....	.....	1887	16	2.67	.....	...	.....	.....
Denison	.....	.....	1878	27	6.62	.....	...	.....	.....
Decatur	.....	.....	1878	27-29	6.14	.....	...	.....	.....
Fort Elliott	1880	10.62	1885	10-11	3.47	1885	11	1 00	2.10
El Paso	.....	.....	1881	9	0.50	1880	21	0 40	1.93
Do	.....	.....	.....	.....	.....	1880	25	0 40	1.24
Do	.....	.....	.....	.....	.....	1881	8	0 20	1.31
Do	.....	.....	.....	.....	.....	1881	9	1 00	1.00
Fort Griffin	.....	.....	1878	27-29	6.68	.....	...	.....	.....
Galveston	.....	.....	1873	25	2.88	1874	11	1 00	1.60
Graham	.....	.....	1878	27	3.44	.....	...	.....	.....
Jefferson	.....	.....	1869	4	2.50	1869	4	1 10	2.50
Do	.....	.....	1869	29	2.75	1869	29	2 15	2.75
Luling	.....	.....	1883	7	4.00	.....	...	.....	.....
Melissa	.....	.....	.....	.....	.....	1875	31	2 30	2.50
Mesquite	.....	.....	.....	.....	.....	1875	25	0 30	1.00
Miami	.....	.....	1888	16	2.50	.....	...	.....	.....
New Ulm	1873	14.38	.....	.....	.....	1876	...	1 00	1.12
Orange	.....	.....	1888	6	5.49	.....	...	.....	.....
Palestine	.....	.....	1888	6	3.16	1882	31	0 26	1.37
Do	.....	.....	.....	.....	.....	1888	6	0 30	1.58
Ringgold Barracks	.....	.....	1878	27	3.25	1860	15	0 45	1.45
Rio Grande City	.....	.....	1878	27	4.19	.....	...	.....	.....
San Antonio	.....	.....	1885	2-3	3.47	1878	22	1 15	2.20
Weatherford	.....	.....	1883	25	2.70	.....	...	.....	.....
Utah.									
Salt Lake City	1874	2.42	.....	.....	.....	.....	...	.....	.....
Vermont.									
Burlington	1874	7.15	.....	.....	.....	.....	...	.....	.....
Virginia.									
Accotink	.....	.....	1878	30	3.50	.....	...	.....	.....
Cape Henry	.....	.....	1879	31	4.25	.....	...	.....	.....
Comorn	.....	.....	.....	.....	.....	1876	13	0 45	1.52
Fort Myer	.....	.....	1878	29-30	4.71	.....	...	.....	.....
Johnstown	.....	.....	1887	23	4.20	1876	12	1 00	1.40
Do	.....	.....	.....	.....	.....	1886	22	2 21	2.35
Lynchburg	.....	.....	.....	.....	.....	1880	27	0 20	1.00
Do	.....	.....	.....	.....	.....	1882	28	0 40	1.65
Do	.....	.....	.....	.....	.....	1887	7	1 05	1.10
Do	.....	.....	.....	.....	.....	1851	7	1 00	1.20
Fort Monroe	.....	.....	1888	6	2.52	.....	...	.....	.....
Norfolk	1874	8.81	.....	.....	.....	.....	...	.....	.....
Petersburg	.....	.....	1888	27	2.60	1888	20	1 30	2.50
Do	.....	.....	1888	30	3.16	.....	...	.....	.....
Woodlawn	.....	.....	.....	.....	.....	1880	12	1 30	1.75
Wytheville	.....	.....	1878	28-29	4.40	1887	23	1 00	2.62
Do	.....	.....	1887	23	2.62	.....	...	.....	.....
Washington.									
Tatoosh Island	1886	6.52	.....	.....	.....	.....	...	.....	.....
West Virginia.									
Parkersburg	1888	10.33	1888	8-9	3.10	.....	...	.....	.....
Morgantown	.....	.....	.....	.....	.....	1879	26	1 00	1.50
Helvetia	1876	10.00	.....	.....	.....	.....	...	.....	.....
Buckhannon	1888	10.36	1888	9	3.25	.....	...	.....	.....
Do	.....	.....	1888	10	3.90	.....	...	.....	.....
Wisconsin.									
Beloit	.....	.....	1876	4-5	4.50	.....	...	.....	.....
Do	.....	.....	1878	10-11	4.60	.....	...	.....	.....
Do	.....	.....	1879	6-7	3.35	.....	...	.....	.....
Bloomfield	.....	.....	1878	10-11	7.00	.....	...	.....	.....
Embarras	1885	10.45	1885	19-20	3.75	.....	...	.....	.....
Green Bay	.....	.....	.....	.....	.....	1887	2	0 57	2.07
La Crosse	1883	11.03	1877	8	2.69	1878	14	0 45	1.25
Do	.....	.....	1879	6-7	4.70	.....	...	.....	.....
Do	.....	.....	1881	20	4.61	.....	...	.....	.....
Do	.....	.....	1883	20	2.60	.....	...	.....	.....
Do	.....	.....	1885	29	3.20	.....	...	.....	.....
Madison	.....	.....	1878	10	3.82	.....	...	.....	.....
Do	.....	.....	1879	7	3.70	.....	...	.....	.....
Milwaukee	.....	.....	1887	1-2	2.98	1879	3	0 45	1.07
Monticello	.....	.....	1879	9	5.60	.....	...	.....	.....
Wyoming.									
Cheyenne	1875	4.47	.....	.....	.....	1872	23	0 30	1.00
Do	.....	.....	.....	.....	.....	1872	25	0 35	1.42
Do	.....	.....	.....	.....	.....	1875	24	0 52	1.04
Do	.....	.....	.....	.....	.....	1888	24	0 20	0.60
Fort McKinny	.....	.....	.....	.....	.....	1888	8	0 20	1.00

*June 30 to July 1.
†July 31 to August 1.

WINDS.

The most frequent directions of the wind during July, 1888, are shown on chart ii by arrows flying with the wind. On the Atlantic coast from Virginia northward the most frequent directions were from southwest to northwest; on the South Atlantic coast, from northeast to southeast; from the west Gulf coast northward to the Missouri Valley from southeast to southwest; in the extreme Northwest, from north to northwest; in the Lake region, upper Mississippi and Ohio valleys, plateau and Pacific coast regions, variable.

HIGH WINDS.

No maximum velocities of fifty, or more, miles per hour, other than those given in the table of miscellaneous meteorological data have been reported, except at Mount Washington, N. H., where 116 miles per hour from the northwest occurred on the 13th.

LOCAL STORMS.

1st. *Dakota.*—Fort Meade: a "cloud-burst" is reported to have occurred four miles from this place; creeks and "dry-runs" overflowed, carrying away bridges, barns, and other out-buildings. Brayton, Sully Co.: a violent storm, having some of the characteristics of a tornado, occurred here at 9.30 p. m. The width of its path was about two miles, length six miles. Several buildings were wrecked. *Wisconsin.*—A tornado is reported to have occurred in Kewaunee county, causing damage to dwellings and barns in the towns of Lincoln, Luxembourg, and Red River.

4th. *Iowa.*—Cedar Falls, Black Hawk Co.: eighteen buildings, including dwellings and barns, were either partly or entirely demolished in this vicinity by the storm which occurred on this date. Des Moines: a moderate thunder-storm, accompanied by heavy rain, occurred during the evening, and though the storm was not very severe in this city, it is reported to have been very violent northwest and northeast of here. Emmitsburg, Palo Alto Co.: the severe storm of this date unroofed a number of buildings in this vicinity and greatly damaged crops. Reports from Algona, Kossuth Co., state that the storm blew down out-buildings and trees in that county.

4–5th. *Iowa.*—Cromwell, Union Co.: a severe thunder-storm prevailed from 11 p. m., 4th, to 1 a. m., 5th; it was accompanied and followed by heavy rain, 6.50 inches having fallen during the night. Much damage was done to property along the streams in this vicinity.

5th. *New Jersey.*—The New Jersey Weather Chronicle of the State Weather Service, for July, states:

> The most destructive thunder-storm of the month occurred on the 5th, when the Pennsylvania Railroad round houses near New Brunswick and a barn near Middlebush were blown down; serious damage occurred in other portions of Middlesex county from wind, hail, and lightning, especially at Middlebush and Milltown. At Asbury Park the new Roman Catholic church was blown down. The destruction to crops was serious and wide spread; whole fields of grain were destroyed.

New York.—Albany: an unusually severe rain and hail storm passed over this city between 2.25 and 2.38 p. m., during which time 1.00 inch of rain fell. The wind reached a maximum velocity of forty-five miles per hour, unroofing several houses, and small boats on the river were capsized. *Pennsylvania.*—Scranton, Lackawanna Co.: a severe electrical storm accompanied by very heavy rainfall occurred here in the afternoon. Much damage was done by lightning and heavy rain. The following is from the "Baltimore Sun" of the 6th:

> PHILADELPHIA, *July* 5.—The Lackawanna Valley was visited this afternoon by the most furious storm ever known there. Two men and two horses were killed by lightning in Scranton and great damage was done throughout the valley. The rain fell in torrents, while the lightning flashes were sharp, vivid and almost incessant. The streets were flooded with water. At Jermynville and Barbertown hailstones larger than walnuts fell. The fruit trees were stripped of their limbs and leaves, and all growing gardens and crops were totally destroyed.

6th. *Dakota.*—Salem, McCook Co.: a severe wind and hail storm caused considerable damage in the southwestern part of this county. *Minnesota.*—Shakopee, Scott Co.: at 3.45 a. m. a severe storm passed over this place, causing a large amount of damage to buildings. Reports from Brown and Nicollet counties state that the storm was severe in those counties. Sleepy Eye, Brown Co.: a severe storm occurred during the early morning, damaging crops and buildings. *Texas.*—The Signal Service observer at Palestine writes the Chief Signal Officer concerning a shower of pebbles which is reported to have occurred at that place as follows:

> PALESTINE, TEX., *July* 7, 1888.
>
> The CHIEF SIGNAL OFFICER, *Washington City:*
>
> SIR:—I have the honor to transmit a specimen of rock, or pebbles, that fell during the heavy rain storm of the 6th at the residence of Mr. Lacy, about five blocks from this office. The ground for about half an acre was partly covered with the pebbles, the formation of which is not found in this section. Mr. Lacy's family saw the pebbles fall during the rain, and, therefore, there can be no doubt about it.
>
> Very respectfully, your obedient servant,
>
> W. H. PERRY,
> *Sergeant, Signal Corps.*
>
> NOTE.—The specimens of pebbles submitted range in size from an eighth to one-fourth of an inch in diameter, were of irregular shapes, and resemble in appearance those generally found at the bottom of a brook, or on the sea-shore. C. S. O.

6th. *Wyoming.*—The Cheyenne "Daily Sun" of the 7th states that a very severe and destructive hail storm occurred at Laramie City at about 4 p. m., lasting about thirty minutes. Some of the hail stones are said to have been six inches in diameter. Gardens were destroyed and much window glass broken.

7th. *Indiana.*—Montpelier, Blackford Co.: a violent rain and hail storm passed near here. Small buildings, fences, &c., were levelled, and the corn crop in the path of storm was damaged to a great extent by the hail. *West Virginia.*—Lee, Wirt Co.: a severe hail storm occurred in the afternoon, some of the hail stones being as large as hen's eggs.

8th. *Michigan.*—Edwardsburg, Cass Co.: nearly all buildings at this place were more or less injured by a severe storm which occurred about 11 p. m. *Missouri.*—Kansas City: a very heavy rain storm prevailed between 10 and 11 p. m., causing damage estimated at $20,000 in the southeastern part of the city. *Ohio.*—Lima, Allen Co.: about 1 a. m. a thunder-storm, accompanied by high wind and hail passed over this place, causing serious injury to the corn crop in neighboring localities. Mansfield, Richland Co.: much damage was done to crops east and south of here by the heavy rainfall accompanying the storm of this date. *Virginia.*—Morrisville, Fauquier Co.: a destructive storm swept through a narrow belt of country in the lower part of this county between 9 and 10 p. m. Several buildings were destroyed and other damage done. Lexington: a severe wind and rain storm occurred between 10 p. m. and midnight, causing damage to crops. *Wyoming.*—Fort McKinney: large hail, accompanied by very heavy rain, occurred between 2.20 and 3.10 p. m.; crops and telegraph lines suffered serious damage, and several bridges were washed away.

9th. *Illinois.*—Cairo: a severe thunder-storm, accompanied by unusually heavy rain, occurred in the afternoon; the rain fell in torrents for about half an hour and the wind blew at the rate of forty-eight miles per hour, all locomotion in the streets being interrupted during the storm, and several merchants suffered considerable damage from flood. *Virginia.*—The Petersburg "Index-Appeal" states that a violent and destructive hail storm occurred in the afternoon in Chesterfield county, the hail stones being unusually large.

11th. *Massachusetts.*—The Signal Service observer at Boston reports the following:

> On the 11th, at 10 p. m., a terrific thunder-storm set in and continued until nearly midnight, when there was a lull which lasted about five minutes, after which the wind suddenly came up and blew with tremendous force, continuing but a few minutes, when it again died away. During the calm, from 12 to 12.05, the barometer fell 0.03 of an inch, and during the gust that followed it rose 0.05. One-fourth of a mile from the place of observation a path was discovered, the breadth of which was from a few rods wide at the western end (in Brighton) to about one-tenth of a mile where the maximum force seems to have been attained. The course was E. 13° N., and the track about two and one-

half miles in length. The path was apparently in a straight line and was marked by trees uprooted or twisted off, prostrated fences and chimneys, unroofed, or otherwise damaged, buildings. A glue factory was entirely demolished, and a part of a rope-walk, weighing several tons, was lifted off its foundation, carried a few feet, and crushed to the ground. Along the path were also frail buildings undisturbed, and flower-pots remaining about on posts, indicating (as several persons mentioned) that the storm did not travel along the surface, but bounded as it went along, touching the ground now and then.

New York.—Buffalo: high wind set in at 12.58 and continued until 8.49 p. m., attaining a velocity of forty-eight miles per hour at 5.30. More than fifty vessels were detained in the harbor during the storm. Rochester: a severe storm passed over this city from northwest to southeast in the afternoon, the wind reaching fifty-two miles per hour at 6.55. Oswego: light rain and occasional thunder occurred from 4.26 to 7.10 p. m.; the wind blew in gusts, reaching a maximum velocity of thirty-eight miles per hour, north. This storm was one of the severest of the season, and caused considerable damage to fruit trees and telegraph wires. Oswego Falls, Oswego, Co.: a wind and hail storm in the afternoon caused considerable damage to crops in this vicinity and at Fulton. Ogdensburg, Saint Lawrence Co.: about 5 p. m. a violent wind and hail storm passed through the northern part of this county, doing a large amount of damage. The storm appears to have been most severe about three miles north of Malone, where buildings and trees were blown down. Chateaugay, Franklin Co.: a large amount of damage was done in this vicinity by a severe storm during the evening. Waddington, Saint Lawrence Co.: numerous barns and some dwellings were unroofed in this county. Moira, Franklin Co.: numerous buildings were destroyed by a severe storm on this date. Clyde, Wayne Co.: from 7 to 7.30 p. m. a violent thunderstorm prevailed at this place. Several barnes were unroofed and orchards badly damaged. Concerning the storm of this date the following is from the "Malone (N. Y.) Palladium:"

The severest and most destructive storm which has been experienced in northern New York for a third of a century swept through Saint Lawrence and Franklin counties, and on into Clinton and over into Vermont last week (Wednesday evening), its greatest fury being expended along a belt of from one to three or four miles south of the Canadian border. It also extended thirty or forty miles south, but with less of destructiveness. In Malone there was a furious precipitation of large jagged hail just before 6 p. m., and an hour later a gale which broke down many trees and injured crops, particularly hops; but otherwise we escaped injury. Not so, however, was it in Bombay, Fort Covington, Constable, Burke, and Chateaugay, from all of which comes statements of loss and curious effects rivaling those which are told concerning similar visitations in the West.

15–16th. *Kansas.*—The Signal Service observer at Topeka reports:

The hail storm on the night of the 15–16th in Logan and Scott was about three miles wide, and cut all crops in its path to the ground; at Pence it destroyed many glass fronts and badly injured the roof of the bank building

17th. *Kansas.*—Tribune, Greeley Co.: the rain and hail storm in the afternoon was of great severity. West of this place the rainfall was remarkably heavy and flooded the surrounding country. The hail stones were unusually large and covered the ground along the path of the storm to depths ranging from two to three inches. The Signal Service observer at Topeka, reports:

The hail storm in Greeley and Hamilton on the 17th broke all glass on the west and north sides of buildings in its path, cut all crops to the ground, and killed the birds and grown chickens. Many of the houses in this section are "dugouts," and the heavy rain in this storm filled them up level with the ground. During this storm the temperature fell to 32° in the southern part of Greeley.

18th. *Louisiana.*—Shreveport: several houses were unroofed during the storm which prevailed between 8 and 8.30 p. m.; maximum velocity forty-two miles per hour. *Michigan.*—Cheboygan, Cheboygan Co.: a violent hail and wind storm occurred twelve miles southeast of here, its path being about four miles wide. Hail fell to a depth of two inches. *Pennsylvania.*—Erie: a thunder-storm moving from west to east began at 9.30 and ended at 10.35 p. m.; unusually heavy rain fell during the storm, causing great damage in this city and in the surrounding country.

19th. *West Virginia.*—The tornado observer, Mr. Thomas J. Orr, at Roney's Point, Ohio Co., reports as follows:

This place was visited by the severest rain storm that has ever occurred here; buildings were swept away, fences and crops were totally destroyed, roads were left destitute of bridges, and many lives were lost. The storm occurred in the afternoon, commencing at 5.30 p. m., in the central part of the county, and bearing gradually south until it exhausted its force near the southern line of the county. The clouds were of a light or coppery color, and during the severest part of the storm appeared to have a rotary motion without making any progress. The force of the storm was confined to an area of twenty miles east and west and six miles north and south. The day had been very warm, the thermometer at noon reading 90°, with a sultry atmosphere. The prevailing direction of the wind was west, but the storm appears to have been one of those local ones which gathered and expended its force without traveling in any direction. The duration of the storm was two hours and twenty minutes, and in that time it frequently increased and diminished in violence, but all the time it kept up a constant pour down; the amount of rainfall as observed at several points was about eight inches.

20th. *Dakota.*—Huron: a severe storm of wind, rain, and hail occurred between 7 and 8 p. m., about twelve miles north of Huron. *Vermont.*—East Berkshire, Franklin Co.: a violent storm, apparently a tornado, passed near here, moving in a southeasterly direction. Its path was about one-fourth of a mile wide, within which crops were completely ruined. Hail fell to a depth of five inches in the path of the storm.

21st. *Iowa.*—Dysart, Tama Co.: a very severe hail and rain storm passed eight miles southwest of this place at 7 p. m.; the storm was very destructive from the northwestern part of Grundy county extending forty miles eastward, and its breadth varied from two to six miles. It is reported that the hail-stones were of unusual size, and killed hogs, calves, and smaller animals; trees were entirely stripped of their leaves and much damage was done to the outstanding crops; one school-house was totally demolished and many barns wrecked. The damage is estimated from $500,000 to $1,000,000.

22d. *Iowa.*—Waterloo, Black Hawk Co.: a severe and destructive hail storm occurred about sixteen miles south of this place, and also in the vicinity of Reinbeck, Grundy county. *Nevada.*—Winnemucca, Nev.: a "cloud burst" is reported to have occurred twelve miles southwest of station on this date, causing considerable damage.

23d. *Michigan.*—Port Huron: a thunder-storm, accompanied by heavy rain, occurred between 5.20 and 6 p. m.; wind velocity thirty-six miles per hour. A severe hail storm is reported to have occurred in the vicinity of Brockway, twenty miles north of Port Huron. At Brockway Centre and Kenockee, Saint Clair Co., considerable damage was done to crops by a severe hail storm. *Ohio.*—Sandusky: a thunder-storm accompanied by hail and heavy rain prevailed from 2.20 to 4.30 p. m. Considerable damage resulted from this storm to crops in the surrounding country.

24th.—*Virginia.*—Dale Enterprise, Rockingham Co.: a destructive hail storm passed one and a half miles north of this place at 1.30 p. m.; hail-stones of unusual size fell in large quantities; garden-vegetables and the standing corn were badly cut.

25th. *Minnesota.*—Moorhead: destructive hail storms accompanied by high wind, occurred to the south and east of this place in the afternoon. Duluth: a severe thunder-storm, accompanied by heavy rain, passed over this city between 2.45 and 9 p. m.; the rain was the heaviest that has occurred here for years and flooded basements, &c. The storm moved from west to east. *Vermont.*—North Enosburg, Franklin Co.: a violent hail storm occurred to the north and east of this place about 4 p. m.; corn and other crops were considerably damaged.

26–27th. *Iowa.*—Denmark, Lee Co.: an unusually heavy rain storm began at 11 p. m., 26th, and ended at 2 p. m., 27th; during that time 4.81 inches of rain fell, most of it in two hours; the surrounding country was flooded.

28th. *Indiana.*—Salem, Washington Co.: the storm in the afternoon was the severest of the season and was accompanied by a brilliant display of lightning; 2.37 inches of rain fell in about an hour, causing considerable damage by washing away fences, etc.

29th. *Illinois.*—Fairmont, Vermillion Co.: a tornado passed near this place in the afternoon, destroying crops, uprooting trees, etc.; its path was about two hundred yards wide.

30th. *Minnesota.*—Saint Paul: a severe thunder-storm, accompanied by heavy rain, occurred between 10.08 and 10.15 a. m., maximum velocity of wind fifty-six miles per hour from the west; two barges on the river were sunk, and trees and chimneys were blown down. Telephone instruments were much injured by lightning.

31st. *Pennsylvania.*—Houser Mill, Monroe Co.: a tornado occurred here about 9 p. m. Buildings were demolished and large trees twisted off. This storm was of remarkable violence, and is considered the most severe ever experienced.

Reports concerning the very heavy rain storms of the 9th and 10th in the upper Ohio valley were considered in the preparation of the matter published elsewhere in this REVIEW under the heading "Floods."

WATER-SPOUTS.

Pensacola, Fla.: it is reported that a water-spout was observed over the Gulf at 10.55 a. m., 11th; it moved from northwest to southeast and lasted about twenty minutes.

Saint Augustine, Fla., 18th: about 1 p. m., 17th, a large water-spout was observed in the ocean opposite North Beach. At 3 p. m. it crossed the narrow sand spot of North Beach and entered the bay with a terrible rush and ominous roar, churning up the water in a terrible whirlpool. It came directly toward the town, and was much smaller than when first observed. It crossed the town going southwest, and crushed in several buildings; its passage being followed by torrents of rain.—*The (Oswego, N. Y.) Palladium.*

On the evening of the 17th a water-spout burst near Purcell Station on the banks of the river Duckee, Ind., covering the railroad tracks and surrounding country with two feet of water. A passenger train was derailed.

INLAND NAVIGATION.

STAGE OF WATER IN RIVERS AND HARBORS.

Arkansas River.—Dodge City, Kans., 14th: the water in the river at this place is from one to two feet wide and some inches deep, being the lowest stage of water observed here for many years; the river is entirely dry a few miles below this city.

Cumberland River.—Nashville, Tenn., 28th: the navigation of the season is at a stand still on account of low water; the past season has been an unusually short one; a great deal of freight is waiting transportation on the upper Cumberland, which cannot be brought down until after the autumn rise.

Tennessee River.—Chattanooga, Tenn.: on account of low water navigation was closed to all vessels on the 28th.

In the following table are shown the danger-points at the various stations, the highest and lowest depths for July, 1888, with the dates of occurrence and the monthly ranges:

Heights of rivers above low-water mark, July, 1888 (in feet and tenths).

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
Red River:						
Shreveport, La.	29.9	8 to 11	20.2	31	14.4	6.8
Arkansas River:						
Fort Smith, Ark.	22.0	1	9.0	24	2.5	6.5
Little Rock, Ark.	23.0	1	13.1	26, 27	4.3	8.8
Missouri River:						
Kansas City, Mo.	24.0	2, 3	20.4	31	12.1	8.3
Omaha, Nebr.	18.0	1	16.1	31	9.9	6.2
Leavenw'rth, Kans.	20.0	3	18.2	31	11.7	6.5
Mississippi River:						
Saint Paul, Minn.	14.5	1	7.8	30	4.7	3.1
La Crosse, Wis.	24.0	1	9.9	31	5.9	4.0
Dubuque, Iowa	16.0	1	12.1	31	6.4	5.7
Davenport, Iowa	15.0	1	9.5	31	4.5	5.0
Keokuk, Iowa	14.0	9, 10	10.1	31	5.1	5.0
Saint Louis, Mo.	32.0	1	27.1	31	16.4	10.7
Cairo, Ill.	40.0	19, 20	28.7	31	17.3	11.4
Memphis, Tenn.	34.0	22	23.6	31	15.2	8.4
Vicksburg, Miss.	41.0	10, 11	30.0	31	25.5	4.5
New Orleans, La.	13.0	1 to 3	10.4	31	8.1	2.3
Ohio River:						
Pittsburg, Pa.	22.0	11	22.0	28	1.6	20.4
Cincinnati, Ohio	50.0	15	31.5	4	7.4	24.1
Louisville, Ky.	25.0	16	11.3	1, 5, 6	4.6	6.7
Cumberland River:						
Nashville, Tenn.	40.0	1	13.3	31	2.1	11.2
Tennessee River:						
Chattanooga, Tenn.	33.0	1	7.1	29	1.8	5.3
Savannah River:						
Augusta, Ga.	32.0	31	9.3	16	6.3	3.5
Willamette River:						
Portland, Oregon	.....	1	14.6	31	7.0	7.6

FLOODS.

A destructive flood, resulting from the heavy rains of the 8th, 9th, and 10th, occurred along the valley of the Monongahela River, and the rivers of western Pennsylvania and West Virginia were swollen into torrents. At Grafton the rise was unprecedent, and the lumber interests suffered severely, the loss to the town and section being estimated at $250,000. The damage at Rowlesburg was also heavy. Advices from Wheeling, W. Va., state that the freshet was the greatest ever known in that section, and that the destruction to property was beyond computation. The Signal Service observer at Pittsburg reports "that owing to the heavy rains in the Monongahela Valley the Monongahela River rose at the rate of nine inches per hour throughout the day of the 10th, carrying destruction along its shores from the headwaters to the mouth of the river. At points above Pittsburg the river was higher than ever before, reaching forty-three feet at Greensborough, Penn., on the 11th. The damage done by the overflow at Pittsburg during the 10th and 11th is estimated at $300,000. The river began to fall on the 12th." At Parkersburg, W. Va., the Kanawha River rose thirteen feet on the 10th, washing away one bridge. The following total rainfalls, in inches, from the 8th to the 10th, inclusive, have been reported from stations in Pennsylvania: Pittsburg, 1.60; Uniontown, 2.43; Indiana, 3.56; Somerset, 2.00; Charlesville, 1.56; Huntingdon, 1.62. From the 7th to the 10th the precipitation at Parkersburg, W. Va., amounted to 7.32 inches, and at Columbus, Ohio, 3.24 inches fell during the 8th and 9th. The heavy rains of the 9th and 10th were also very destructive in central and southern Illinois, and in portions of eastern Indiana, causing great damage to crops. A terrific rain storm or cloud-burst occurred at Wheeling, W. Va., on the evening of the 19th. Many lives were lost; houses were wrecked; bridges carried away, and great damage done to property. Reports from all parts of Ohio county, W. Va., indicate that the storm was very disastrous to life and property. At Triadelphia it was particularly severe. Over a considerable part of Belmont county, Ohio, the damage to fruit and crops was very great.

During the afternoon of the 1st a heavy rain storm of short duration visited Deadwood, Dak., and vicinity, causing floods in the gulches and valleys, and doing considerable damage to property, live stock, and crops.

HIGH TIDE.

Galveston, Tex., 5th.

ATMOSPHERIC ELECTRICITY.

THUNDER-STORMS.

From the accompanying table it will be seen that thunder-storms were reported from the largest number (thirty-four) of states and territories on the 5th, and nearly as many (32) occurred on the 27th and 30th, respectively. They were least extensively reported on the 15th, on which date they occurred

in but fourteen states and territories; the 1st, 12th to 14th, having each almost the same number as the 15th.

In Dakota, Florida, Illinois, Iowa, Minnesota, Nebraska, and Texas thunder-storms occurred on from twenty-five to thirty days during the month; Florida reporting the maximum number of dates. They occurred on six days, or less, in Connecticut, District of Columbia, Idaho, Kentucky, Maryland, Nevada, New Hampshire, and Washington Territory; Idaho reporting the least. There was no state or territory in which they did not occur:

Table showing the number of stations in the several states and territories reporting thunder-storms for each day during July, 1888.

State or Territory.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.	Total
Alabama	....	1	1	1	1	3	2	....	2	2	1	....	....	....	1	....	1	....	....	2	....	1	....	1	....	2	2	....	1	2	2	29
Arizona	....	....	1	....	....	1	....	....	....	2	3	....	3	3	3	4	6	5	2	2	1	4	1	6	3	4	6	7	7	6	5	85
Arkansas	....	2	2	1	3	3	....	2	3	....	....	....	....	....	....	3	2	2	....	....	....	1	....	....	....	....	1	2	2	2	1	32
California	....	1	....	1	....	....	....	....	....	....	3	....	....	....	....	1	3	3	1	1	....	....	....	....	....	....	....	....	1	1	....	16
Colorado	....	....	....	....	1	....	3	2	....	....	....	....	....	1	3	1	2	....	2	1	2	2	3	2	1	3	1	1	2	1	3	37
Connecticut	....	....	....	....	4	....	....	....	....	....	1	....	....	....	....	....	....	....	....	2	....	....	....	1	....	....	....	....	2	....	3	....	13
Dakota	9	2	5	5	3	2	9	2	....	....	....	....	9	1	6	1	1	....	....	7	3	7	1	3	6	5	3	7	5	7	2	111
District of Columbia	....	....	....	....	1	....	....	1	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	4
Florida	3	6	5	1	2	1	....	2	3	2	3	4	1	2	7	7	2	1	3	3	5	5	4	3	4	4	4	3	4	3	1	98
Georgia	....	....	....	....	4	3	1	2	3	3	2	1	1	2	2	....	....	....	....	2	2	1	1	4	5	4	4	5	4	3	....	59
Idaho	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	2
Illinois	....	3	26	29	5	4	15	37	12	2	....	....	1	10	....	6	6	2	1	....	2	14	1	....	10	20	11	12	4	3	16	252
Indiana	....	....	....	4	....	....	4	3	2	....	....	....	....	....	....	....	1	....	....	....	....	1	3	....	....	....	4	1	....	....	2	25
Indiana Territory	....	....	....	....	1	2	....	3	....	....	....	....	....	....	....	2	2	2	....	....	1	....	....	....	....	....	....	....	....	....	....	13
Iowa	....	2	20	24	5	4	17	14	1	....	....	....	8	7	....	11	2	1	1	1	16	2	1	4	7	9	4	1	3	1	8	174
Kansas	....	1	2	1	3	3	2	13	6	....	....	....	3	6	6	13	2	1	....	1	....	4	7	5	2	1	3	2	....	1	....	87
Kentucky	....	....	....	....	....	....	....	2	2	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	3	....	....	....	....	9
Louisiana	4	3	3	2	4	2	3	4	4	2	1	....	....	1	2	4	6	2	3	....	....	....	....	....	2	1	7	3	1	1	1	66
Maine	....	....	....	....	1	....	2	....	....	....	4	1	....	....	....	....	....	....	....	1	....	....	....	2	2	....	....	1	....	2	2	18
Maryland	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	1	....	....	2	....	....	....	....	4
Massachusetts	1	....	....	....	8	....	....	....	....	....	10	2	....	....	....	....	....	....	....	3	....	1	8	2	1	....	....	....	5	....	....	41
Michigan	....	2	16	9	3	14	7	14	5	4	3	8	....	....	....	....	1	8	....	....	2	16	3	....	....	7	....	1	....	3	24	150
Minnesota	11	9	5	3	4	7	10	1	2	4	2	1	3	....	2	6	2	....	1	6	8	1	....	....	5	1	6	8	8	12	3	131
Mississippi	1	....	1	1	1	2	....	....	2	2	1	....	....	....	....	....	2	....	....	....	....	....	....	....	1	....	....	....	....	....	1	16
Missouri	....	....	1	....	1	....	1	2	1	....	....	....	....	1	....	3	....	....	....	....	....	....	....	2	1	....	1	1	1	1	1	18
Montana	2	....	1	....	1	4	2	1	....	....	....	5	1	2	1	....	....	....	1	1	1	1	....	2	2	6	2	2	1	....	....	39
Nebraska	1	2	4	3	1	....	4	6	2	....	....	....	5	2	2	5	2	....	....	....	5	4	5	1	4	1	7	....	1	2	....	69
Nevada	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	1	....	....	....	....	....	2	....	1	....	....	....	....	....	....	....	....	5
New Hampshire	....	....	....	....	....	....	1	....	....	....	5	....	....	....	....	....	....	....	1	2	....	....	....	2	....	....	....	....	....	....	1	12
New Jersey	1	....	1	1	4	....	3	....	....	....	1	1	....	....	....	....	....	....	3	1	....	1	....	2	....	1	4	1	....	3	2	30
New Mexico	2	1	....	....	1	....	....	2	1	....	....	....	....	1	2	1	1	....	1	2	2	1	5	4	2	1	....	3	....	....	1	34
New York	....	....	....	3	12	....	1	1	1	1	13	1	....	....	....	....	....	7	12	2	2	....	1	1	....	....	2	1	....	....	7	68
North Carolina	2	....	....	3	3	....	1	3	1	5	1	....	2	....	....	....	....	....	....	....	....	....	....	....	1	1	4	5	2	1	1	36
Ohio	....	....	....	11	5	1	10	11	3	....	8	3	....	....	....	....	2	5	2	1	1	7	11	....	....	....	3	....	....	1	12	97
Oregon	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	2	2	1	1	....	....	....	1	....	....	1	....	....	2	3	14
Pennsylvania	....	....	1	6	20	1	2	8	3	1	3	12	....	....	....	....	2	5	12	6	....	....	7	8	....	1	19	2	2	2	4	127
South Carolina	1	1	....	....	3	1	....	5	6	8	1	....	....	....	....	....	....	....	....	2	....	....	....	....	3	2	6	3	2	2	1	47
Tennessee	....	1	4	8	10	2	8	5	12	....	....	....	2	1	1	....	2	2	3	3	....	....	1	4	7	8	7	10	10	9	1	121
Texas	5	3	3	6	4	3	5	3	2	4	1	1	2	....	1	2	4	4	4	1	1	2	1	....	....	....	4	2	1	3	....	72
Utah	....	....	....	....	1	....	....	....	....	....	1	1	....	....	....	....	....	....	....	1	2	1	1	2	....	....	....	1	....	....	....	11
Vermont	....	....	....	....	1	....	2	....	1	....	5	....	....	....	....	....	1	....	1	2	....	....	3	....	....	1	2	3	1	1	7	31
Virginia	1	1	1	2	6	1	1	5	5	1	1	1	3	1	....	1	....	1	....	1	....	1	1	3	....	1	....	1	....	....	....	41
Washington	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	1	....	....	2
West Virginia	....	....	....	3	5	....	5	4	3	1	....	1	1	....	....	1	1	1	3	....	....	....	....	....	....	....	2	....	....	....	....	31
Wisconsin	....	1	7	3	....	11	1	6	....	....	....	....	....	....	....	1	....	....	....	....	6	8	....	....	1	3	....	4	....	6	9	67
Wyoming	5	....	....	....	3	2	4	4	....	....	1	....	1	....	....	1	....	....	....	2	....	1	3	3	5	2	3	1	....	2	1	44
Number of States reporting	15	18	21	25	34	24	28	30	27	16	24	17	17	15	14	21	25	20	20	29	18	25	23	27	21	23	32	29	23	32	29	

AURORAS.

Auroras were observed on but few dates during July, all of which were very faint and confined to small sections of the country.

Auroras were observed during the month as follows: 1st, Alpena, Mich.; Lyons and Oswego, N. Y. 7th, Gardiner, Me. 16th, Burlington, Vt. 17th, Oswego, N. Y. 22d, Newburyport, Mass. (suspected). 28th, Gardiner, Me.; Lyons, N. Y.; Burlington, Vt. 29th, Webster, Dak.; Gardiner, Me. 13th.

MISCELLANEOUS PHENOMENA.

DROUGHT.

Lead Hill, Boone Co., Ark.: the month has been very warm and dry, and crops are suffering severely from drought.

Fort Apache, Ariz.: the drought which had continued uninterrupted for sixty days was broken by light rain on the 6th, and freqfient rains occurred after that date throughout the month.

Yankton, Dak., 13th: the protracted drought in this vicinity has caused some damage to small grain; the drought was broken by the heavy rains on this date.

Augusta, Ga.: the prevailing dry weather during the first nineteen days of the month caused serious apprehension of a total failure of corn and other crops; the drought was broken by showers on the 20th.

Salina, Saline Co., Kans.: the unusually hot and dry winds during the last ten days of the month have reduced the corn crop about 40 per cent., and creeks and wells are running short of water. A similar period of heated winds has not occurred since 1874.

Cunningham, Kingman Co., Kans.: the hot and dry weather during the last ten days of the month has affected the crops very seriously in counties south of this place; the drought has been still more severe, and farmers are cutting up thin corn for fodder.

Yates Centre, Woodson Co., Kans.: the month has been unusually dry, corn is much damaged, pastures are drying up, and water for stock is scarce.

Lamar, Mo., 4th: the drought in this section is doing serious damage to corn. Rain fell on the 8th, breaking the drought. It was reported on the 26th that stock and crops were suffering from drought.

Springfield, Mo., 26th: the protracted drought of the past fifteen days has been very injurious to crops.

Thornville, Lapeer Co., Mich.: the month has been very dry; corn, potatoes, and young clover have suffered most from the drought.

Wytheville, Wythe Co., Va., 31st: a drought has continued for the last two months, and though light rains have fallen at intervals, they have not been sufficient to break it, and all kinds of vegetation have suffered in consequence.

FOREST AND PRAIRIE FIRES.

Coral, Montcalm Co., Mich., 19th: fires in the woods during

the past few days have done great damage. At Howard City great damage is reported along the railroads.

Watertown, Jefferson Co., N. Y., 18th: the unusually dry weather that has prevailed throughout northern New York, besides ruining the hay crop, has resulted in a large loss to farmers and others by fire. Many valuable pieces of timber, as well as fencing and other property, were destroyed, and the losses will amount to many thousands of dollars.

Prairie and forest fires occurred also as follows: Fort Reno, Ind. T., 4th, 6th, 8th; Fort Bridger, Wyo., 10th, 15th; Fort Sill, Ind. T., 23d to 31st; Ashland, Oregon, 25th.

HALOS.

The dates on which solar halos were observed over the greatest extent of territory during July were from the 6th to 11th, 16th, 23d, and 31st; they were least numerous on the 4th, 12th, 19th, 22d, and 27th; none were observed on the 20th. They were observed on from eight to thirteen days in Dak., Ill., La., Mich., N. Y., Ohio, Va.; Ohio reporting the maximum; none were reported from Ala., Colo., Conn., Del., D. C., Md., Miss., Mont., Nebr., N. Mex., R. I., W. Va., Wyo.

But few lunar halos were reported during the first half of the month, there being eleven days during that period on which none were recorded; the greatest number, though not numerous, were reported on the 17th and 22d, in eight states and territories. They were seen on from five to seven days in Ark., Ind., Mo., Tex. None were reported from Ala., Cal., Colo., Conn., Dak., Del., D. C., Idaho, Ind. T., Ky., Me., Md., Miss., Mont., N. Mex., N. Y., Ohio, Oregon, R. I., S. C., Utah, Vt., Wis., Wyo.

The phases of the moon, Washington mean time, during July, as given in "The American Ephemeris and Nautical Almanac," are as follows: new moon, 8th, 13h. 8.4m.; first quarter, 15th, 19h. 4.6m.; full moon, 22d, 12h. 36.9m.; last quarter, 30th, 3h. 21.4m.; apogee, 3d, 5.3h.; perigee, 18th, 24.0h.; apogee, 31st, 0.9h.

METEORS.

New York City: a meteor of unusual brilliancy was observed at 10.10 p. m. on the 4th; it crossed the sky from the northwest to the southeast and had the appearance of an ordinary sky rocket.

Fort Stanton, N. Mex.: a very brilliant meteor was observed at 11 p. m., 4th; it was first visible in Azimuth 190° and altitude 30° and traveled about 20° in a southwesterly direction.

Webster, Day Co., Dak.: a large meteor was observed about 10 p. m., 11th; it exploded in the north at an altitude of 45°; the meteor was similar to the sun in brightness and objects cast shadows to the south.

Montrose, Colo.: an unusually bright meteor was observed in the north, altitude 35°, at 11.30 p. m., 22d; it moved in a northerly direction and was visible for about three seconds. The meteor was followed by a long ray of light which remained in sight for about eighteen seconds.

Auburn, Ala.: an unusually large meteor was observed in the north at 9 p. m., 25th; it left a blue streak in its path.

Butlerville, Jennings Co., Ind.: a bright meteor was observed on the evening of the 25th; it passed almost due east of this place and disappeared with a loud report; the meteor was accompanied by a luminous trail which was visible for about ten seconds.

Knoxville, Tenn.: a brilliant meteor was observed falling directly under the polar star at 10.35 p. m., 26th.

Meteors were also observed as follows: 1st, Kalamazoo, Mich.; Stateburg, S. C. 3d, 10th, 19th, 23d, 24th, Kalamazoo, Mich. 4th, Banning Cal.; Marion, Va. 5th, Yaquina Light House, Oregon. 6th, Kalamazoo, Mich.; Wauseon, Ohio; Marion, Va. 8th, Blue Hill Observatory, Mass. 11th, Webster, Dak.; Cedar Rapids, Iowa; Kalamazoo, Mich.; Tiffin, Ohio. 13th, Yuma, Ariz.; Manchester, N. H.; Cleburne and Mesquite, Tex.; Rappahannock, Va. 14th, Newburyport, Mass. 15th, 17th, Utica, N. Y. 18th, Cedar Rapids, Iowa; Kalamazoo, Mich. 22d, Banning, Cal.; Montrose, Colo.; Kalamazoo, Mich.; Beverly and Egg Harbor City, N. J. 24th, Newburyport, Mass. 25th, Jacksonborough, Ohio; Cleburne, Tex. 26th, Webster, Dak.; Kalamazoo, Mich.; Cleburne, Tex.; Rappahannock, Va. 28th, Cedar Rapids, Iowa; Jacksonborough, Ohio; Stateburg, S. C.; Marion, Va. 29th, Kalamazoo, Mich.; Cleburne, Tex. 30th, Cleburne, Tex.; Marion, Va. 31st, Lead Hill, La.

MIRAGE.

The only stations reporting mirage during the month were Webster, Dak., on the 2d, 3d, 5th, 6th, 9th, 10th, 12th, 14th to 25th, 31st; and Yuma, Ariz., on the 2d.

SAND STORMS.

Red Bluff, Cal.: a dust whirl occurred in this city at 3 p. m. on the 18th, its diameter being about thirty feet; it rose into the air fully 2,000 feet, and when it reached its maximum height the column broke and the dust flew off laterally in all directions. A similar dust whirl, which rose about 10,000 feet in the air, is reported to have been observed at the same time five miles east of this city.

Sand storms occurred also as follows: Rio Grande City, Tex., 9th, 10th, 25th, 29th; Fort McDowell, Ariz., 18th, 19th; Fort Bowie, Ariz., 23d, 26th.

VERIFICATIONS.

The percentages of verifications of the official indications of the Signal Service for July, 1888, were not completed in time to be published in this REVIEW. They will will be published in a later number.

LOCAL VERIFICATIONS.

The following extracts from the published reports of the state weather services for July, 1888, show the percentages of verification of weather and temperature signals for the various states:

Michigan.—Weather signals are now displayed in one hundred and thirty towns in the state, and upon the baggage-cars of twenty-six trains of eight of the principal railroads of the state.

The indications are issued at 10 p. m., daily, from the Chief Signal Office, Washington, and are for the twenty-four hours from 7 a. m. to 7 a. m.

The percentage of verification of these indications for July is as follows (the verification is taken from reports of displaymen furnished this office monthly): temperature, 79.3 per cent; weather, 80.7 per cent.; temperature and weather, 80.0 per cent.

Weather signals are displayed on the baggage cars of the following railroads: C. & G. T. R'y; D., G. H., & M. R'y; D. D. G. T. R'y; M. C., main line and branches; C. & W. M. R'y; G. R. & I. R'y; P. H. & N. W. R'y; and the P. O. & P. A. R'y.

Minnesota.—The verification of weather signals were: 72 per cent. for weather, and 79 per cent. for temperature.

Nebraska.—The percentages of correct weather predictions for the state were: temperature, 81.6; weather, 78.0; mean, 79.8.

Ohio.—The percentage of verification of weather signals received from the Signal Office in Washington, and distributed to twenty-nine display stations, was 81 for weather, and 81 for temperature.

Oregon.—At Albany, weather, 78 per cent.; temperature, 84 per cent. At Roseburg, weather, 81 per cent.; temperature, 55 per cent. General average for the state, 75 per cent.

South Carolina.—The percentage of verification of the weather and temperature predictions for the state was: weather, 75.0; temperature, 80.0.

STATE WEATHER SERVICES.

The following extracts are republished from reports for July, 1888, of the directors of the various state weather services:

ALABAMA.

The month has been about an average July in all respects except in the amount of rain. The temperature was only 0°.3 above the normal. A few days were quite warm but most of the period was mild, and in most sections of middle and north Alabama the nights were cool and pleasant.

The precipitation was 2.48 inches below the normal. This deficit, however, has produced no serious results because the preceding weeks had given a sufficient amount of rain to greatly advance the crops. The rain was not evenly distributed over the state, some sections having less than one inch.

Summary.

Temperature (in degrees Fahr.).—Monthly mean, 80.9; highest monthly mean, 84, at Selma; lowest monthly mean, 77, at Valley Head; maximum, 100, at Opelika on the 26th, Pine Apple on the 15th, and Marion on the 30th; minimum, 64, at Fort Deposit on the 30th, Gadsden on the 21st, Mount Willing on the 20th, and Talladega on the 24th; range for state, 36; greatest local monthly range, 42, at Marion; least local monthly range, 19, at New Market.

Precipitation (in inches).—Average for the state, 3.08; greatest, 6.00, at Edwardsville; least, 0.76, at Tuscumbia.

Wind.—Prevailing direction, southeast.—*P. H. Mell, jr., Signal Corps, Auburn, director.*

ARKANSAS.

Temperature (in degrees Fahr.).—Monthly mean, 82.1; highest monthly mean, 87.8, at Malvern; lowest monthly mean, 74.3, at El Dorado; maximum, 111.0, at Lead Hill on the 31st; minimum, 56.0, at Forrest City on the 22d; monthly range for state, 55.0; greatest local monthly range, 53.0, at Lead Hill; least local monthly range, 24.0, at Dayton.

Precipitation (in inches).—Average for the state, 3.07; greatest, 8.89, at Dallas; least, 0.26, at Malvern.—*Prof. John C. Branner, Little Rock, director; W. U. Simons, Private, Signal Corps, assistant.*

ILLINOIS.

The noticeable features of July have been a marked uniformity of atmospheric pressure and irregularity in rainfall.

From the 1st to the 8th the oscillations of the barometer were very slight, the pressure being slightly above the average. On the 9th and 10th the only decided "Low" of the month occurred, and from that date until the end of the month the pressure was mostly above the average. The lowest barometer was on the 10th and the highest on the 20th.

The temperature was nearly the average, except at a few stations where it was the average or slightly above. The middle of the month was comparatively cool, but the first and last days were extremly hot. The hottest days were the 7th and 31st; the coolest day was the 14th. During the last days of the month the temperature was everywhere above 90°, and in some instances above 100°.

A marked feature of the month was the great wind and rain storm, on the afternoon of the 4th, which swept across Iowa and this state, doing immense damage to standing crops. In Illinois the oat crop, which had never been so promising, was probably damaged one-third by the wind.

The heaviest and most general rainfall of the month occurred on the 8th and 9th. The following are some of the largest amounts reported: Atwood, 4.68 inches; Mahomet, 3.36; Anna, 2.50; Aledo, 2.42; Peoria, 2.00; Beason, 1.95; Springfield, 1.81; Paris, 1.76; Greenfield, 1.79; Oswego, 1.60. At Peoria on the 8th 1.10 inches fell in thirty minutes; but probably the heaviest rainfall of the month was at Pekin, on the 26th, when 2.20 inches fell in an hour. The heaviest continuous rainfall of which this office has any record occurred, however, on the evening of the 8th and morning of the 9th, in Champaign county, 6.10 inches falling at Philo in twenty-two hours. All the rainfall of the month was in showers, mostly heavy, but varying greatly in amount—in some places far above the average, and in others, only a few miles distant, far below. There was a fall of 8.86 inches at Philo; 7.94 at Pekin; 7.06 at Atwood; 6.81 at Griggsville; 6.48 at Peoria; 6.30 at Jacksonville; while only 0.70 inch was the total for the month at Joliet.—*Col. Charles F. Mills, Springfield, director; James Cassady, Sergeant, Signal Corps, assistant.*

INDIANA.

The temperature during the month was not unusually high; cool nights and moderately warm days prevailed, except on a few days, when the advance of the slight barometric pressure on the 3d and 4th, 8th and 9th and 29th, 30th and 31st were accompanied by temperatures during the day above 90°, and on the 6th and 7th with a higher barometer. Comparing the temperature of July, 1888, with the temperature of July, 1887, an exceedingly great difference will be noted; during the latter the heat was intense each day without interruption, and the maximum temperature everywhere was higher, while during July, 1888, exceedingly high temperatures were reached on comparatively few days.

On account of the very heavy rains on July 8th and 9th, the amount of precipitation was slightly in excess at many stations. The few other rains which fell were badly distributed and of small amount, falling only in passing local showers. Small hail fell on the 23d at Mauzy and on the 28th at Vevay.

The general conditions of the weather during July were favorable to the harvesting of hay and cereals, and, although during the latter part of the month there was hardly sufficient precipitation, the conditions of the weather were also quite beneficial to the growth and maturing of corn, which, at the end of the month, is in excellent condition and promising a better harvest, both in regard to quantity and quality, than the farmers of Indiana have reaped in many years.—*Prof. H. A. Huston, Lafayette, director; C. F. R. Wappenhans, Sergeant, Signal Corps, assistant.*

KANSAS.

Two hot waves during this month carried its mean temperature above the July normal, Shawnee county standing alone with a mean temperature 0°.3 below the normal, while in Leavenworth county it is 0°.2 above the normal. The excess is quite uniform in the eastern counties south of the Kaw, where it is 1°.5. In general terms, this excess increases west from the eastern counties of the state, culminating in the counties from Republic to Sumner, where it is 2° and upwards. It then diminishes slightly till the 100th meridian is reached, where it is about 1°.4 above the normal. It then increases slightly to the west line of the state. The mean temperature for the state is 81°, which varies in the different divisions, being 80° in the western, 82° in the middle, and 81° in the eastern.

Three "rainy spells" passed across the state, occurring about the 8th, 16th, and 24th, giving us an average of 2.64 inches. Of the total amount, the eastern division received 32 per cent., the middle division 28 per cent., and the western division 40 per cent.

Summary.

Temperature (in degrees Fahr.).—Monthly mean, 81; highest monthly mean, 84, at Carneiro and Salina; lowest monthly mean, 77, at Goodland and Topeka; maximum, 117, at Bunker Hill, on the 31st; minimum, 49, at Goodland, on the 18th; range for state, 68; greatest local monthly range, 58, at Ellsworth; least local monthly range, 28, at Coldwater; greatest daily range, 49, at Tribune, on the 4th; least daily range, 7, at Goodland, on the 8th.

Precipitation (in inches).—Average for the state, 2.64; greatest, 7.00, at Morse; least, .30, at Cawker City.

Wind.—Prevailing direction, south.—*Prof. J. T. Lovewell, Topeka, director; T. B. Jennings, Sergeant, Signal Corps, assistant.*

LOUISIANA.

An excess of 1°.0 is noted in the average temperature for the state during the month of July, 1888. During the past seventeen years there have been eight Julys when the average temperature was lower than that for the month just passed; the coolest of which was July of 1882, when the mean was 79°.4. The excess for the past month occurred in the northern section of the state, the mean for the southern section being about the normal.

There was a deficiency of one and one-half inches in the average rainfall for the state during the past month, being a deficiency of one inch in the northern section and two inches in the southern section. The southern part of the state received one inch more rainfall than the northern part. The distribution was inequal, and the rains generally local in character. Trinity and Lafayette alone report a daily rainfall exceeding two inches.

Summary.

Temperature (in degrees Fahr.).—Monthly mean, 82.6; highest monthly mean, 84.8, at Vidalia; lowest monthly mean, 78.1, at Lafayette; maximum, 102, at Minden on 16th and 26th; and at Liberty Hill on 14th, 24th, 25th, and 26th; minimum, 60, at Calhoun on the 22d and 23d; and at Liberty Hill on 22d and 23d; range for state, 42; greatest local monthly range, 42, at Liberty Hill; least local monthly range, 24.5, at New Orleans; greatest average daily range, 27.0, at Liberty Hill; least average daily range, 14.3, at New Orleans.

Precipitation (in inches).—Average for the state, 3.44; greatest, 6.77, at Lafayette; least, 0.84, at Girard.

Wind.—Prevailing direction, south.—*R. E. Kerkam, Sergeant, Signal Corps, New Orleans, in charge.*

MICHIGAN.

Temperature (in degrees Fahr.).—The mean temperature for July, 69.8, is 1.4 below the normal of thirteen years. The temperature was below the normal in all sections during July. The greatest deviation occurred in the upper peninsula, and the least in the northern and southern sections. There has been but a small change in the daily temperature this month. The mean daily temperature was above the normal on eleven days, and below the normal on sixteen days, being normal on four days. The highest mean daily temperature, 77, occurred on the 3d and 30th, when the temperature was 6 and 5 above the normal, and the lowest, 60, when the temperature was 12 below the normal. The highest mean daily temperature for the past thirteen years occurred on the 19th, 1876, 89, and the lowest, 60, occurred on the 4th, 1882, and 12th, 1888. The highest mean monthly temperature, 74.3, occurred in 1876 and 1878, and the lowest, 66.7, occurred in 1884. The maximum temperature, 100, occurred at Houghton on the 3d, and at Omer on the 30th. The warm days occurred on the 3d, 4th, 5th, and 6th, 29th, and 30th. The temperature was reported above the normal at only two stations, viz: Adrian, excess 0.6, and at Marshall, excess 1.1 for the month.

Precipitation (in inches).—The average amount of precipitation for July, 1.92, is 1.40 below the normal of thirteen years. The precipitation was below the normal in all sections, the greatest deficiency occurring in the upper peninsula and the least in the northern section. In the central section the greatest deficiency occurred in the counties of Huron, Gratiot, Clinton, Ionia, Macomb, and Ingham. In the southern section there was a deficiency in the counties of Berrien, Branch, Calhoun, Hillsdale, and Jackson. General rains occurred on the 8th, 12th, 18th, 22d, 26th, and 31st.

Wind.—Prevailing direction, southwest.—*N. B. Conger, Sergeant, Signal Corps, Lansing, in charge.*

MINNESOTA.

The most notable feature of the month was the frequency of thunder-storms. The average was one every three days for each station, and many of the storms were violent, especially in the southern division of the state.

Temperature (in degrees Fahr.).—Considering the whole state, the temperature was nearly 1 below the normal. In the vicinity of Saint Paul and Minneapolis the temperature was about normal. There was a deficiency of from 1 to 2 in the southern part of the state, and in the vicinity of Lake Superior the deficiency amounted to 3.

Precipitation (in inches).—An average amount of rain fell during the month, but the distribution was not equal. At Saint Paul there was an excess of 2.26 over the normal of seventeen years. In the southern and eastern counties there was a slight deficiency. At Saint Vincent there was a deficiency of 0.15 as compared with previous months of the same name.

Wind.—The prevailing direction of wind, southwest.—*Prof. W. W. Payne, Northfield, director; John Healy, Private, Signal Corps, Saint Paul, assistant.*

MISSISSIPPI.

Temperature (in degrees Fahr.).—Monthly mean, 82; highest monthly mean, 86, at Columbus; lowest monthly mean, 79, at Corinth; maximum, 104, at Columbus on 5th, and Brookhaven on 14th; minimum, 56, at Corinth on 23d; range for state, 48; greatest local monthly range, 44, at Corinth; least local monthly range, 21, at Biloxi; greatest daily range, 36°, at Hazlehurst; least daily range, 1, at Pearlington. The monthly mean temperature, 82, is the same as it was for this month last year and is about the normal. The maximum temperature at the different stations generally occurred on the 14th and the minimum on the 21st. The highest temperature reported during the month was 104 at Columbus on the 5th, and the same at Brookhaven on the 14th. The lowest temperature was 56 at Corinth on the 23d, and 60 at Port Gibson on the 22d.

Precipitation (in inches).—Average for the state, 3.41; greatest, 6.60, at Palo Alto and Aberdeen; least, 0.85, at Artonish Plantation. The average rainfall for the state 3.41, is very near the normal. Average rainfall for this month last year, 4.38. The rain was generally well distributed both as to quantity and time.—*Prof. R. B. Fulton, Oxford, director; M. J. Wright, jr., Sergeant, Signal Corps, assistant.*

MISSOURI.

The average temperature for July was 79°.2. The highest reported was 111°.0 at Protem, and the lowest was 50°.0 at Ironton. The average of maximum temperatures was 99°.2, and the average of minimum temperatures 61°.6, making an average monthly range of 37.6.

The average precipitation was 3.26 inches, which was 0.43 inch below the normal for July. The greatest amount reported was 10.48 inches at Kirksville, and least 0.50 inch at Springfield.—*Prof. Francis E. Nipher, Saint Louis, director; G. A. Weber, Sergeant, Signal Corps, assistant.*

NEBRASKA.

The past month has been one of extremes of temperature but with a preponderance of hot days, and there has been throughout the state, except in the southwestern corner, about the normal rainfall.

Precipitation (in inches).—The rainfall has ranged from 1.00 at Red Willow to over 5.00 at De Soto and at Sargent, the heaviest rainfall extending along the Missouri River and also along the middle Loup; all but a small area in the southwestern corner of the state have had over 2.00, so that in general the rainfall has been greater than for the corresponding month in the two years past. What is also of importance the number of rainy days has been normal.

Temperature (in degrees Fahr.).—The mean temperature for the month has been over 3 above the normal; maximum for the state is 105 at Kimball, with maximum at other stations ranging above 100 generally; the minimum was 45 also at Kimball.

There has been a larger number than usual, however, of cloudy days. The weather has been generally favorable for nearly all crops.—*Prof. Goodwin D. Swezey, Crete, director; G. A. Loveland, Corporal, Signal Corps, assistant.*

NEVADA.

The temperature for July was slightly below and the pressure slightly above normal. The highest temperature reported, 113°, occurred at Eldorado Canyon on the 22d; and the lowest, 25°, occurred at Austin on the 19th.

The rainfall for July was light and considerably below the average. The heaviest fall reported was 1.13 inches at Ely, White Pine county.—*Prof. Charles W. Friend, Carson City, director; Charles A. Read, Sergeant, Signal Corps, assistant.*

NEW ENGLAND METEOROLOGICAL SOCIETY.

The month is remarkable for its small number of warm days and its consequent low average temperature. In only a few instances were readings of 90° reached, and the average temperature at twenty-one stations shows a deficiency of 3°.3 when compared with the records of past years.

Thunder-storms.—These were numerous, and in a few instances wide-spread and destructive. On the 5th thunder-storms occurred in New Hampshire, Massachusetts, Rhode Island, and Connecticut, and on the 7th in Maine, New Hampshire, and Vermont; both series related to the low depression then passing near Newfoundland. On the night of the 11–12th severe showers were general over New England, with high winds, which reached the violence of a tornado at Cambridge and Monson, Mass., and Canaan, N. Y. The unusual phenomenon of a luminous electric cloud 60° by 20°, with incessant lightning, was noted at Manchester, N. H. Between the 19th and 31st thunder was reported from some station on every day, except the 25th. The storms best developed in this interval were on 20th–21st in all the states of New England, on the 23d and 24th in Maine, New Hampshire, central Massachusetts, and Connecticut, and on the 31st in all of the states. Of these storms those on the 20th–21st and 31st were situated south and the others southwest of the centre of their respective depressions.

Summary.

Temperature (in degrees Fahr.).—Monthly mean, 66.1 (93 stations); highest monthly mean, 70.6, at Olneyville and Hartford; lowest monthly mean, 61.1, at Berlin Falls; maximum, 94, at Stratford, on the 22d; minimum, 32, at Williamstown, on the 15th; range for New England, 62; greatest local monthly range, 58, at Berlin Mills; least local monthly range, 27, at Nantucket; greatest daily range, 49, at Berlin Mills, on the 2d; least daily range, 2, at Cambridge and Cotuit, on the 27th and 28th respectively.

Precipitation (in inches).—Average for New England, 2.38 (115 stations); greatest, 5.67, at Long Plain; least, 0.91, at Belmont.

Wind.—Prevailing direction, southwest.—*Prof. William H. Niles, Boston, Mass., president; Prof. Winslow Upton, Providence, R. I., secretary; O. N. Oswell, Sergeant, Signal Corps, Boston, Mass., assistant.*

NEW JERSEY.

The mean temperature for July, 1888, 71°.1, is only three-tenths of a degree higher than the mean for June, and is 3°.4 below the average determined from past records of forty-eight stations. The highest temperatures (above 90°) were recorded on the 5th, 7th, 23d, and 24th, and the lowest (below 50°) on the 2d, 14th, 18th, and 19th.

The average rainfall for the state, 3.40 inches, is 0.82 inch below the July average, and was unevenly distributed. The largest total for the month, 7.03 inches, is reported from Burlington county, and the least, 1.25 inches, from Morris county. The largest total in twenty-four hours, 3.78 inches, occurred at Oceanic on the 19th, and at Moorestown, 3.13 inches, on the 19th and 20th.

Summary.

Temperature (in degrees Fahr.).—Monthly mean, 71.2; highest monthly mean, 76.0, at Trenton; lowest monthly mean, 67.7, at Hanover; maximum, 99.0, at Lambertville, on 23d; minimum, 45.0, at Hanover and Tenafly on 14th and 18th, respectively; range for state, 54; greatest local monthly range, 50, at Tenafly; least local monthly range, 32, at Ocean City; greatest daily range, 42, at Tenafly on 3d and 25th; least daily range, 2, at Oceanic on 9th.

Precipitation (in inches).—Average for the state, 3.50; greatest, 7.03, at Moorestown; least, 1.25, at Gillette.

Wind.—Prevailing direction, northwest and southwest.—*Prof. George H. Cook, New Brunswick, director; E. W. McGann, Sergeant, Signal Corps, assistant.*

NORTH CAROLINA.

Temperature (in degrees Fahr.).—Monthly mean, 76.4; highest monthly mean, 80.0, at Salisbury; lowest monthly mean, 73.9, at Lynchburg; maximum, 104, at Cheraw, S. C., on 9th; minimum, 52, at Weldon, on the 2d; range for state, 52; greatest local monthly range, 45, at Lamberton; least local monthly range, 23.4, at Hatteras.

Precipitation (in inches).—Average for the state, 3.45; greatest, 6.24, at Hatteras; least, 1.46, at Weldon.

Wind.—Prevailing direction, northeast.—*Dr. Herbert B. Battle, Raleigh, director; H. McP. Baldwin, Sergeant, Signal Corps, assistant.*

OHIO.

Temperature (in degrees Fahr.).—The mean temperature of the northern section was 70.5; of the middle section, 72.3; and of the southern section, 73.6. These means are 1.5, 1.0, and 1.3 below the averages for these sections. The mean temperature for the state, 72.1, is 1.3 below the six-year mean. The maximum temperature, 97.0, occurred at Dayton on the 7th, and the minimum, 42.0, at Youngstown on the 13th. The mean daily range, 22.6, agrees with the mean range for July. The greatest daily range was 41.0 at Paulding on the 30th, and the least, 5.0, at Hiram on the 9th.

Precipitation (in inches).—General and very heavy rains occurred in all sections on the 8th, 9th, and 18th. General rains in all sections on the 4th and 5th; in the middle and southern sections on the 7th; in the northern section on the 12th, 23d, 26th, and 27th; and in the southern section on the 27th. Local rains occurred in the northern section on the 7th, 11th, 17th, 19th, 22d, and 31st; in the middle section on the 6th, 10th, 12th, 13th, 17th, 23d, and 27th; and in the southern section on the 10th, 13th, 17th, 19th, 23d, and 24th. The heaviest in any twenty-four hours occurred at Newcomerstown, where 4.04 of rain fell between 3 p. m. of the 8th and 3 p. m. of the 9th. The mean rainfall in the northern section was 3.44; for the middle section, 4.87; and for the southern section, 4.91. These means are .08, 1.26, and 1.50 above the means for July. The mean for the state, 4.40, is 0.94 above the average, making the deficiency for the year to August 1, 1.72. The cloud-burst and flood of the 19th, which caused so much damage and heavy loss of life at Wheeling, West Virginia, also caused considerable damage on the Ohio side at Martin's Ferry, Aetnaville, Bridgeport, Bellaire, and Saint Clairsville.—*Prof. B. F. Thomas, Columbus, president; Lieut. Charles E. Kilbourne, secretary; C. M. Strong, Private, Signal Corps, assistant.*

PENNSYLVANIA.

Temperature (in degrees Fahr.).—The mean temperature for July, determined from the tri-daily observations, was 69.4, and from the mean maximums and mean minimums, 69.2. These are about 3 below the normal. At Philadelphia the monthly deficiency of temperature was 124, and at Pittsburg, 113. The highest temperatures did not reach the average maximums by a few degrees, and the minimums ranged about 4 below those generally recorded in July. The extremes reported were, Charlesville, 97; Carlisle, 96; Huntingdon, 94.5; Somerset, 94.5; Quakertown, 94; Philadelphia, 93.8; York, 93.5; Chambersburg, 93.5; Reading, 93.5, the highest; and Coudersport, 38; Dyberry, 39; Smethport, 39; Wellaborough, 40; Honesdale, 41; New Castle, 41; and Wysox, 41, the lowest. Most of the high temperatures occurred on the 4th and 7th, and the lowest on the 13th, 14th, and 16th. The nights were generally cool.

Precipitation (in inches).—There was an average of 3.45 of rainfall, which is from half to three quarters of an inch below the normal. It was fairly well distributed, although a few stations report decided departures from the average. The greatest totals were: Uniontown, 7.10; Indiana, 7.04; Beaver, 5.18; New Castle, 4.90; and Lock Haven, 4.75. The least were: Coudersport, 1.40; Smethport, 1.40; Drifton, 2.16; and Emporium, 2.17. The heaviest amounts fell on the 8th, 9th, 18th, 19th, and 27th. It was seasonably distributed throughout the month, and there were few complaints from drought.—*Under direction of the Franklin Institute, Philadelphia; T. F. Townsend, Sergeant, Signal Corps, assistant, in charge.*

SOUTH CAROLINA.

The mean temperature for the month was 78°.9, being 3°.1 less than July, 1887, when 82°.0 was recorded. In most instances the highest maximum temperature occurred on the 8th and 9th; the minimum temperature on the 18th.

The mean depth of rainfall for the month was 3.68 inches, while the record for July, 1887, shows a mean depth of 7.49 inches. The greatest amount of precipitation occurred at Charleston, where a fall of 6.06 inches was recorded; and the least monthly precipitation, 1.50 inches, at Allendale.—*Hon. B. F. Butler, Columbia, director; William Line, Sergeant, Signal Corps, assistant.*

TENNESSEE.

The month of July was characterized by two hot waves which prevailed during the first and last weeks, by the small percentage of cloudiness and deficient rainfall. The amount of electrical disturbances was rather less than usual.

Temperature (in degrees Fahr.).—The mean temperature was 77.6, a little above the July mean of the past six years, the highest during the period being that of last year. The highest local mean was 83, recorded at Woodstock, and the lowest was 74°, recorded at Greeneville. The maximum temperature recorded was 102, on the 29th, at Hohenwald, and was the highest during the six years. The minimum temperature was 54, recorded also at Hohenwald, this station showing the rare occurrence of the two extremes in one month. This was 2 below the minimum of July of last year, which was the highest recorded during the past six years. The maximum temperature was generally recorded on the 7th, 13th, 28th, and 31st, and the minimum on the 14th and 21st. The daily ranges were very near the normal.

Precipitation (in inches).—The mean precipitation was 2.60, more than 1.00 less than the July mean of the past six years. Of this amount the eastern division received an average of about 3.00, the middle division about 2.75, and the western division a little more than 1.50. The rains which fell during the month were mostly local in character, only three or four were what might be termed general rains falling during the month, these were on the 9th, 10th, 19th, and 29th. The greatest daily rain was on the 19th, and the greatest local rainfall in twenty-four consecutive hours was 2.38, on the 17th, at Ashwood, and the next was 2.15, on the 18th, at Waynesborough. At only a few stations was reported more than 1.00 of daily rainfall, and these are principally in the middle division. The greatest monthly rainfall was 5.00, recorded at Fostoria, and the least was 0.55, recorded at Lawrenceburg; the latter was the least amount recorded in July the past six years; the next being 0.67, at Howell, in Lincoln county, in 1886. Rain was reported on twenty-two days. Hail was reported at only one station during the month. Dews were reported at various stations on twenty-six days.

Wind.—The prevailing winds were west and southwest.—*J. D. Plunket, M. D., Nashville, director; H. C. Bate, Signal Corps, assistant.*

TEXAS.

The data used in this review is based upon the records received from sixteen special cotton region stations, nine regular stations of the Signal Service, and the 8 a. m. daily weather maps issued at Galveston. The weather for July in Texas has been slightly cooler than the average, the mean temperature averaging from 0.5° to 1° lower. Moderate rains were general in the state up to and including the 10th of the month. Since that date light showers here and there only have been reported. Later reports indicate that the country is suffering from drought, but not to any great extent, however. The meteorological features were uniform pressure and temperature, absence of general and destructive storms, and excessive precipitation.

Temperature (in degrees Fahr.).—The average temperature for the state for July was 83. The mean of maximum temperature for the state was 92.5, and the mean of minimum temperature 74.2. Compared with the month of June, the average maximum temperature was about 3 higher, and the average minimum temperature 2 higher. At seven places in the state the maximum temperature was reported 100 and over. The absolute range of temperature for the state was 46°. The average range for the state was 31.4. The greatest monthly range reported was 41 at Fort Elliott and Sour Lake, and the least monthly range, 16, at Cuero. The highest temperature reported in the state was 105 at Sour Lake on the 2d, 15th, and 16th; the lowest temperature, 59, at Weatherford, on the 23d.

Precipitation (in inches).—The average rainfall for Texas for July was 2.25. This amount is 3.85 below the average for June of this year, and 0.80 below the normal for July, as deduced from observations covering a period of several years. The average monthly precipitation for four months—April, May, June, and July—for the state was 5.00. The following-named places report amounts exceeding 2: Tyler, 7.83; Orange, 6.98; Palestine, 4.35; Columbia, 3.93; Corsicana, 3.57; Huntsville, 2.94; Houston, 2.91; Waco, 2.60; Fort Elliott, 2.50; Corpus Christi, 2.25; and Brenham, 2.24; and the following-named places report amounts less than one inch: Abilene, Belton, Cuero, Hearne, Longview, Luling, Rio Grande City, and San Antonio. The greatest amount of precipitation in any twenty-four hours occurred at Orange, 5.49, on the 6th. Columbia had 3.04 on the 4th, and Palestine 2.57 inches on the 6th. The average precipitation for four months ending July 31st was somewhat in excess of the average for the state. The greatest monthly precipitation was 7.83 at Tyler, and the least monthly precipitation, 0.10, at Longview.—*S. O. Young, M. D., Galveston, director; Allen Buell, Sergeant, Signal Corps, assistant.*

Meteorological record of voluntary observers and Army post surgeons, July, 1888.

The maximum and minimum temperatures at stations marked thus (*) are from readings of other than standard instruments.

Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean.	Precip'n.
Alabama.	°	°	°	*Ins.*
Auburn	93	66	80.0	4.55
Bermuda	95	73	81.0	2.05
Carrollton	91	72	80.0	5.70
Citronville	100	62	83.2	2.13
Edwardsville	97	71	80.7	6.00
Eufaula	97	65	80.0	1.65
Florence	93	73	81.0	2.23
Fort Deposit	98	64	80.0	2.92
Gadsden	94	64	79.0	2.75
Greensborough	94	70	82.0	3.37
Livingston	95	75	84.0	2.02
Marion	100	68	82.8	2.70
Mt. Vernon B'ks	99	67	83.1	2.67
Mount Willing	98	64	78.5	2.45
New Market*	89	71	78.9	5.74
Opelika	100	65	80.9	2.80
Pine Apple	100	65	83.2	.....
Selma	97	76	84.4	2.90
Talladega	93	64	81.8	4.83
Troy	97	73	81.0	4.27
Tuscaloosa	94	65	83.4	1.72
Tuscumbia	98	69	80.6	0.76
Union Springs	97	70	81.0	1.33
Valley Head	94	67	77.0	2.72
Arizona.				
Antelope Valley	.....	.....	.....	2.14
Bangharts	.....	.....	.....	1.60
Cedar Springs	.....	.....	.....	0.69
Fort Huachuca	97	59	.....	7.96
Fort McDowell	116	61	93.0	0.85
Fort Mojave	114	52	.....	0.20
Globe	.....	.....	.....	2.47
Holbrook	100	49	77.0	0.68
Showlow	.....	.....	.....	T.
Teviston	.....	.....	.....	0.26
Tucson	105	85	.....	1.58
Winslow	.....	.....	.....	0.43
Williams	.....	.....	.....	1.35
Arkansas.				
Alexander	100	70	82.5	2.12
Conway	98	65	82.7	3.41
Dallas	99	68	82.8	8.89
Dayton	98	74	82.1	6.70
Devall's Bluff	98	59	81.3	2.98
El Dorado	94	60	74.3	1.95
Forrest City	97	56	82.2	0.60
Heber	99	60	80.9	1.00
Helena	99	63	82.3	2.30
Hot Spring	.....	60	.....	1.22
Lead Hill	111	58	84.2	1.15
Lonoke	99	66	83.0	3.62
Malvern	103	70	87.8	0.26
Monticello	98	61	82.4	2.85
Newport	105	64	84.1	2.10
Osceola	95	62	82.4	1.15
Ozone	94	66	78.3	3.54
Pine Bluff	99	64	83.5	5.31
Portia	103	67	83.8	3.48
Russellville	100	63	82.7	3.70
Stuttgart	96	68	81.3	1.70
Texarkana	100	62	83.4	1.62
Washington	97	62	80.9	4.23
British Columbia.				
New Westminster	86	49	63.4	1.47
California.				
Alcatraz Island	66	51	58.4	.....
Angel Island	95	.....	63.4	T.
Banning	103	54	.....	0.18
Barstow	107	52	80.8	0.22
Benicia Barracks	.....	.....	69.2	0.01
Fort Bidwell	96	40	70.8	0.36
Fort Gaston	104	37	69.9	0.30
Fort Mason	.....	.....	61.3	.....
Georgetown	99	46	.....	0.04

Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean.	Precip'n.
California—Cont'd.	°	°	°	*Ins.*
Hydesville	85	41	60.4	0.27
Lewis Creek*	106	60	83.0	.....
Needles	113	71	94.3	1.38
Oakland	91	52	62.2	.....
Oroville	102	56	79.8	0.07
Presidio of San F	87	53	59.5	.....
Sacramento	100	48	70.2	0.01
Salinas	84	54	61.4	0.00
Santa Barbara	86	52	67.0	0.00
Santa Maria	89	48	66.0	0.00
Willow	111	49	80.1	0.06
Colorado.				
Bennett	115	65	.....	.....
Fort Lewis	90	40	66.3	1.54
Georgetown	84	46	62.5	2.82
Connecticut.				
Canton	92	44	.....	3.14
Hartford *a*	88	52	70.6	1.90
Hartford *b*	88	52	70.4	2.35
Mansfield	87	50	66.4	1.93
Middletown	90	49	67.6	1.92
New Hartford	90	52	67.8	4.34
Shelton	86	46	67.8	2.42
Southington	88	57	69.2	1.85
Thompson	85	49	67.6	.....
Voluntown	92	58	.....	1.75
Waterbury	91	44	66.4	2.73
Dakota.				
Brookings	101	42	70.4	1.61
Davenport	97	48	69.9	3.04
Fort A. Lincoln	97	50	70.7	3.32
Fort Meade	98	54	.....	2.64
Fort Pembina	94	44	69.8	3.06
Fort Sisseton	100	49	70.1	3.48
Fort Sully	106	51	76.0	3.40
Fort Totten	.....	50	67.8	2.95
Fort Yates	101	50	73.0	3.66
Garden City	97	46	70.4	4.55
Gallatin*	.....	.....	67.0	.....
Highmore	104	51	.....	5.79
Kimball	104	50	66.9	0.90
New England City	97	42	73.0	0.90
Parkston	96	40	67.6	1.16
Richardton	98	52	69.8	4.05
Webster	101	52	74.2	2.88
Woonsocket	107	43	75.1	1.62
District of Columbia.				
Distribut'g res'v'r*	91	60	76.0	3.10
Kendall Green	107	50	76.4	0.36
Receiving res'v'r*	91	61	75.6	3.56
Washington aque.*	95	64	78.8	.....
Florida.				
Altamonte Springs	98	71	.....	.....
Alva*	92	71	78.3	5.95
Archer	102	65	82.2	3.74
Fort Meade*	97	76	82.0	10.17
Homeland*	97	72	82.7	4.45
Manatee	94	73	84.3	7.26
Merritt's Island	96	72	80.2	5.65
St. Francis Bar'cks.	92	69	80.8	3.40
Tallahassee	93	71	81.7	3.45
Georgia.				
Andersonville	100	65	73.8	3.15
Athens	99	62	79.0	1.79
Forsyth*	97	70	82.0	3.08
Marietta	95	65	78.0	2.48
Milledgeville*	95	66	81.4	2.44
Idaho.				
Boisé Barracks	103	44	75.6	0.76
Fort Sherman	97	38	66.0	0.24
Lewiston	103	56	.....	0.34
Illinois.				
Aledo	100	54	75.4	4.50
Beason	98	56	75.2	3.75

Meteorological record of voluntary obeervers, &c.—Continued.

Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean	Precip'n.
Illinois—Cont'd.	°	°	°	*Ins.*
Belvidere	93	55	73.6	6.20
Brush Hill	103	62	77.8	7.33
Cedarville	97	56	72.6	3.30
Centralia	101	68	.....	3.98
Charleston *	95	56	79.7	2.35
Collinsville	96	50	77.5	5.25
Dwight	102	51	76.7	2.44
Eberle	101	66	77.2	4.49
Fairfield	98	64	81.2	1.93
Flora	98	58	78.0	1.79
Greenville	98	56	76.8	6.06
Griggsville	106	61	78.0	6.81
Golconda	95	66	79.5	1.65
Hennepin	97	50	74.7	2.15
Irishtown	97	65	79.3	3.61
Jacksonville	95	60	77.4	6.30
Joliet	98	54	72.4	0.70
Jordan's Grove	100	62	79.3	1.3.
Kampville	98	65	80.3	3.57
Lacon	99	61	78.2	3.61
Lake Forest	95	51	70.7	1.89
Lamark	95	54	76.6	4.96
Mahomet	95	52	74.5	5 38
Mascoutah	101	60	79.4	1.30
Mattoon	101	62	77.0	2.25
McLeansborough	102	62	78.2	2.18
Mount Morris	102	58	81.1	.....
Old Du Quoin	103	59	81.6	2.20
Olney	97	63	78.2	5.64
Oneida	98	58	76.0	3.60
Oquawka	103	63	79.0	4.06
Oswego	100	52	73.6	3.58
Ottawa	98	56	72.6	3.58
Palestine	94	58	75.8	2.30
Pana	96	58	75.0	5.73
Paris	92	60	75.0	2.94
Pekin	102	55	78.5	7.94
Peoria	100	58	79.7	6.48
Philo	94	63	76.0	8.86
Piatt	90	56	75.0	7.06
Pontiac	102	54	77.2	4.32
Richview	99	56	77.8	1.88
Riley	93	49	70.7	3.44
Rockford	93	50	71.4	4.90
Sandwich *	102	60	76.7	4.68
South Evanston	94	51	.....	3.24
Sumner	98	66	80.0	2.70
Sycamore	96	49	71.6	3.10
Watseka	98	54	74.7	2.49
White Hall	94	66	80.8	4.52
Windsor	95	57	76.6	2.36
Winchester	102	53	80.0	5.45
Winnebago	100	59	77.9	7.63
Indiana.				
Angola	93	56	73.4	4.34
Blue Lick	93	60	76.3	3.07
Brookville	94	56	73.9	2.37
Butlerville *	100	66	75.9	3.57
Columbia City	92	56	75.1	3.85
Columbus	98	60	76.4	2.13
Connersville	92	60	74.3	7.18
Crawfordsville	97	.....	.....	3.80
Delphi	98	63	76.6	2.63
Degonia Springs	92	60	77.4	2.45
Farmland	91	60	75.7	3.66
Franklin	96	62	76.4	2.12
Jeffersonville	96	60	78.3	4.89
Lafayette	96	50	74.3	5.41
Lagrange	92	48	72.5	1.94
Logansport	97	56	78.0	1.80
Marion	93	56	73.0	1.20
Mauzy	98	50	73.7	4.86
Mount Vernon	96	60	81.1	2.45
Muncie	105	55	75.8	2.63
Princeton	102	63	80.1	2.60
Richmond	93	58	73.8	3.52
Rockville	94	60	77.2	3.20
Salem	90	65	78.1	5.03
Scalesville	99	62	80.1	2.70
Sunman *	91	53	74.5	3.40
Seymour	90	63	77.8	4.90
Vevay	97	63	76.7	5.92
Worthington	90	63	74.2	4.50
Indian Territory.				
Fort Gibson	102	56	81.8	0.57
Fort Reno	99	63	79.4	3.19
Fort Supply	101	64	82.9	1.18
Iowa.				
Amana	96	54	75.6	4.38
Ames	92	58	75.2	5.15
Cedar Rapids	98	52	76.0	6.03
Clarinda	96	65	79.4	1.80
Clear Lake	97	38	74.0	2.16
Clinton	101	53	74.5	7.07
Cresco	90	56	72.2	4.52
Denmark	91	64	.....	8.45
Des Moines	99	56	76.5	.....
Dysart	96	67	.....	3.80
Elkader	94	59	74.1	5.60
Fayette	93	48	71.3	4.16
Fort Madison	97	64	.....	5.81
Glenwood *a*	100	58	82.2	.....
Glenwood *b*	102	62	81.1	2.52
Grinnell	93	60	77.2	5.35
Hampton	94	53	.....	5.78
Humboldt	87	51	.....	4.04
Independence *	87	57	73.2	4.82
Iowa City	92	51	72.4	4.84
Logan	98	50	79.4	5.09
Manson *	100	62	82.0	4.59
Maquoketa *	99	72	86.0	4.75
Monticello *	100	53	75.3	6.98
Mount Pleasant	.....	.....	75.0	5.40
Mount Vernon *	100	65	78.4	5.15
Muscatine	103	50	74.2	3.39
Osage	.....	.....	.....	3.14
Osceola	87	57	71.2	7.70
Oskaloosa *a*	97	62	.....	7.20
Oscaloosa *b*	99	58	77.9	6.06
Sac City	97	64	74.3	2.56
Smithland	.....	.....	.....	3.00
Vinton	.....	.....	73.6	4.18
Kansas.				
Allison	102	56	.....	2.61
Bucklin	.....	.....	.....	2.80
Buffalo Park	105	66	.....	.....
Brookville *a*	113	63	.....	1.70
Brookville *b*	107	70	83.0	1.00
Bunker Hill	117	70	.....	2.40
Carneiro	103	70	84.0	2.99
Cawker City	105	60	82.0	0.30
Colby	.....	.....	.....	2.05
Cold Water	97	69	81.0	3.60
Collyer	109	64	78.0	1.05
Concordia	102	58	79.0	1.60
Cunningham	105	59	79.7	2.29
Dorrance	113	77	.....	2.00
Dwight	.....	.....	.....	2.31
East Norway	100	66	81.3	3.30
Elco	.....	.....	.....	3.95
Ellis	105	57	.....	.....
Elk Falls	103	60	.....	3.72
Ellsworth	108	50	.....	1.40
Englewood	.....	.....	83.8	3.25
Eureka	104	.....	81.0	2.70
Fort Hays	107	55	80.3	1.40
Fort Leavenworth	95	61	79.2	4.38
Fort Riley	103	61	82.2	3.56
Fort Riley	110	60	80.0	2.37
Gibson	96	70	79.8	3.95
Globe	101	49	77.0	2.10
Goodland	110	70	.....	2.50
Gorham	106	64	.....	6.75
Grainfield	112	64	.....	.....
Grinnell	108	70	83.0	2.20
Grenola	102	59	78.0	2.35
Grove City	104	61	83.0	1.85
Halstead	106	66	.....	4.85
Hays City	.....	.....	.....	2.40
Hill City	104	62	81.0	1.76
Horton	.....	.....	.....	3.55
Hugoton	104	63	80.3	0.77
Independence	105	70	.....	3.50
Kanopolis	97	62	79.5	4.28
Lawrence	106	60	79.5	2.51
Lebo	.....	.....	.....	5.64
Leoti	.....	.....	.....	0.75
Macksville	106	65	81.3	4.29
Manhattan	102	60	.....	2.90
McAllaster	106	66	.....	1.50
Monument	116	62	81.0	.....
Montero	96	64	80.0	7.00
Morse *	106	58	83.0	.....
Oakley	105	70	.....	.....
Ogallah	.....	.....	.....	0.50
Osborne	.....	.....	.....	3.11
Ottawa	108	65	.....	4.70
Quinter	106	62	81.0	2.40
Rome	110	66	.....	4.50
Russell	103	70	84.0	1.21
Salina *	104	71	83.0	1.38
Sedan	101	64	79.0	4.12
Seneca	.....	.....	.....	4.14
Sharron Springs	.....	.....	.....	1.78
Toronto	109	32	80.1	3.82
Tribune	104	75	.....	2.85
Victoria	106	70	82.6	2.19
Wakefield *	102	65	.....	.....
Wakeeney	108	68	.....	.....
Walker	100	58	77.0	3.00
Washburn College	103	63	80.9	2.73
Wellington	102	63	.....	.....
Winona	104	61	81.0	0.99
Wilson *a*	105	68	.....	.....
Wilson *b*	102	58	76.6	1.78
Yates Centre	.....	.....	.....	5.41
Kentucky.				
Ashland	93	52	.....	2.15
Bowling Green	106	50	84.1	3.76
Carlisle	98	54	74.1	2.41
Frankfort	99	54	76.4	0.42
Madisonville	92	54	.....	.....
Millersburg	92	62	.....	.....
Louisiana.				
Abbeville	92	66	82.9	2.82
Alexandria	99	64	82.0	2.42
Amite	100	65	83.0	5.86
Calhoun	98	60	82.9	1.30
Cheneyville	98	61	80.8	4.42
Coushatta	99	61	83.0	2.94
Farmersville	96	64	80.9	2.40

Meteorological record of voluntary observers, &c.—Continued.

Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean.	Precip'n.
Louisiana—Cont'd.	°	°	°	*Ins*
Grand Coteau	94	67	81.8	1.89
Keatchie	99	62	82.4	1.65
Lake Providence	102	75	.....	2.20
Lafayette	97	.....	78.1	6.77
Liberty Hill	102	60	82.0	1.86
Luling	93	73	.....	2.45
Mandeville	99	69	83.7	1.86
Maurepas	96	69	.....	3.18
Marksville	96	70	82.6	1.82
Melville	98	64	84.2	2.28
Minden	102	61	84.0	2.56
Morgan City	95	70	81.9	.....
Monroe	99	66	83.5	1.88
Natchitoches	97	63	82.8	4.76
Saint Joseph	98	63	83.9	3.70
Saint Martinville	92	.....	88.1	3.43
Sugar Ex. Station	98	71	83.5	6.49
Trinity	96	69	84.2	5.15
Vidalia	101	66	84.8	4.09
Maine.				
Bar Harbor	84	48	63.5	3.24
Belfast	81	53	63.3	.....
Calais	86	50	.....	3.05
Dornish	93	51	65.2	1.74
Fairfield	86	45	65.8	3.60
Gardiner	86	50	67.5	2.20
Kent's Hill	84	44	65.0	.....
Lewiston	86	51	67.0	3.62
Mayfield	85	46	63.7	3.48
Orono	86	47	65.1	2.47
Petit Manan	72	44	57.0	.....
Maryland.				
Barren Creek Sp'gs	91	62	74.4	3.55
Cumberland	86	54	70.3	4.34
Fallston	90	54	71.0	4.38
Fort McHenry	92	57	.....	.....
Great Falls *	92	60	75.6	1.50
McDonogh *a*	90	58	72.6	4.00
Summit Hall	.....	.....	68.1	.....
Woodstock	91	50	71.5	2.32
Massachusetts.				
Amherst *a*	86	48	67.6	4.21
Amherst *b*	86	46	67.2	3.63
Beverly Farm	86	50	69.1	2.84
Blue Hill Observ'y *a*	86	50	65.6	1.48
Blue Hill Observ'y *b*	85	48	66.7	1.35
Cambridge *a*	85	51	67.4	2.54
Cambridge *b*	86	51	68.6	2.87
Chestnut Hill	86	48	67.5	1.98
Cotuit	87	48	67.5	4.42
Deerfield *a*	86	43	66.5	1.42
Deerfield *b*	89	54	69.1	.....
Dudley	88	50	67.9	1.48
Fall River	85	52	65.5	4.17
Fitchburg *a*	84	54	67.3	1.94
Fitchburg *b*	84	55	66.6	2.63
Framingham	87	45	67.8	1.59
Gilbertville	86	44	65.0	2.63
Groton	85	49	67.8	2.40
Lake Cochituate	90	42	67.6	1.85
Lawrence	90	50	69.6	2.82
Long Plain	82	50	.....	5.67
Lowell *b*	86	51	69.0	3.06
Ludlow	85	45	64.6	2.85
Lynn	85	50	66.2	2.54
Mansfield	89	43	66.9	2.60
Middleborough	86	41	65.4	3.88
Milton	86	44	65.5	1.25
Monson	87	43	66.6	4.07
Nahant *a*	86	54	66.8	2.29
Nahant *b*	87	52	67.0	2.29
New Bedford *a*	86	50	66.2	5.28
New Bedford *b*	88	47	66.9	4.67
Newburyport	87	51	67.6	2.54
Northampton	88	51	69.9	2.78
Plymouth	86	56	69.2	3.34
Princeton	81	48	65.0	2.62
Provincetown	90	49	67.8	2.12
Rowe	84	44	64.9	2.05
Salem	88	58	67.4	.....
Somerset	92	50	71.4	3.80
South Hingham	.....	42	.....	1.59
Sprinfield	89	53	70.5	3.06
Swampscott	86	52	66.5	2.28
Taunton *a*	91	46	67.5	3.17
Tannton *b*	88	46	67.4	3.40
Taunton *c*	88	41	66.6	.....
Warwick	81	49	63.3	.....
Wellesly	86	43	65.8	4.17
Westborough *	93	47	.....	0.97
Williamstown	83	32	58.0	1.23
Worcester *a*	88	51	68.0	1.60
Worcester *b*	85	52	67.5	.....
Michigan.				
Adrian	95	43	72.2	3.88
Alma	94	43	68.6	0.94
Bad Axe	91	42	68.8	0.50
Battle Creek	94	48	72.2	0.67
Bear Lake	94	42	69.1	3.80
Belle Branch	98	52	73.4	2.98
Bensonia	92	46	67.0	2.60
Benton Harbor	90	57	73.2	3.47
Berlin	92	50	70.3	2.71
Big Rapids	91	44	71.6	1.27
Birmingham	94	43	71.1	2.04

Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean.	Precip'n.
Michigan—Cont'd.	°	°	°	*Ins.*
Bronson	90	46	71.6	1.39
Buchanan	88	51	71.9	1.57
Calumet	88	45	64.4	0.87
Cassopolis	93	51	73.3	1.84
Chase	92	43	64.5	2.35
Charlevoix	91	44	68.7	3.18
Chelsea	92	42	70.6	0.78
Coldwater	91	51	73.1	0.91
Colon	90	56	73.7	2.57
Columbia	94	54	74.3	1.69
Concord	94	50	73.2	0.76
Corunna	91	40	70.6	1.92
Eden	92	49	71.0	1.23
Evart	99	42	71.9	.....
Fletcher	100	51	71.2	1.26
Fort Brady	90	40	.....	0.93
Gaylord	93	42	68.6	1.16
Hanover	88	51	72.0	1.92
Harrisville	92	40	66.0	1.37
Hart	100	45	72.8	2.85
Hastings	90	48	72.4	1.43
Hillman	99	41	68.1	1.20
Houghton	100	50	67.3	2.34
Hudson	94	35	.....	1.90
Ionia	94	38	71.7	1.41
Kalamazoo *a*	88	56	73.2	.....
Kalamazoo *b*	90	50	73.4	2.37
Lansing	88	48	71.1	1.80
Lathrop	98	44	68.0	1.53
Madison	95	50	70.9	3.50
Marshall	93	50	75.1	0.93
Maple Hill	88	39	62.4	1.79
May	91	55	68.6	2.02
Mio	94	44	69.0	1.66
Mottville *	92	49	72.0	2.16
Mount Morris	94	43	71.1	1.90
Mount Pleasant	89	48	73.0	1.04
North Marshall	90	46	67.8	0.59
Omer	98	40	73.4	0.79
Petersburg	93	45	71.6	2.62
Pontiac	85	51	70.7	2.13
Pulaski	93	57	75.6	2.04
Saint Johns	92	49	72.3	1.28
Saint Louis	94	49	71.6	0.92
Sand Beach	88	47	68.0	1.30
Thornville *	90	50	70.1	2.31
Traverse City *a*	97	45	68.0	2.50
Traverse City *b*	94	48	68.2	1.79
West Branch	92	46	68.4	6.57
Williamstown	90	52	70.3	2.30
Ypsilanti	95	44	70.4	2.04
Minnesota.				
Argyle	92	46	67.8	4.48
Delano	92	49	69.3	5.76
Farmington	98	52	74.3	4.95
Fort Snelling	94	52	72.1	5.90
Grand Meadow	100	53	73.4	4.83
L. Winnebegoshish	85	56	67.7	4.07
Leach Lake	87	45	67.8	5.63
Le Sueur	94	60	64.0	0.05
Mankato	91	55	72.8	1.94
Medford	94	48	71.3	2.56
Minneapolis	92	60	72.0	5.56
Morris	95	55	70.3	6.53
Northfield	93	52	72.6	3.74
Pine River	97	58	72.3	3.45
Pokegama Falls	85	41	64.9	3.97
Red Wing	91	55	72.2	3.30
Rochester	83	56	.....	2.52
Rolling Green	93	62	73.2	4.05
Spring Valley	95	48	.....	5.13
Mississippi.				
Aberdeen	98	61	82.0	6.60
Artonish	98	67	84.0	0.83
Batesville	97	63	82.0	0.87
Biloxi	93	72	82.4	2.74
Brookhaven	104	63	83.0	1.09
Columbus	104	65	86.0	6.48
Corinth	100	56	79.0	1.41
Edwards	96	63	83.0	3.46
Greenville	96	69	82.0	2.28
Hazlehurst	100	62	82.0	T.
Hernando	97	61	81.0	3.35
Holly Springs	98	62	81.0	1.10
Jackson	94	66	80.9	5.21
Lake *	101	64	83.0	4.55
Lamar	98	66	82.0	.....
Logtown	93	72	82.0	.....
Macon	102	65	84.0	4.50
Meridian	103	62	83.0	2.29
Natchez	99	65	83.0	3.83
Okalona	100	62	84.0	3.31
Palo Alto	96	64	81.3	6.00
Pearlington	94	72	82.0	.....
Port Gibson	98	60	82.0	1.15
Starkville	94	65	83.0	4.67
Water Valley	.....	.....	.....	2.44
Waynesborough	102	67	84.0	3.13
West Point	96	65	82.0	1.27
Yazoo City	.....	.....	.....	4.50
Missouri.				
Arlington	.....	.....	.....	1.16
Conception	94	62	77.5	2.04
Craig	98	70	80.9	4.15
Fayette	.....	.....	.....	4.05

Meteorological record of voluntary observers, &c.—Continued.

Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean	Precip'n.
Missouri—Cont'd.	°	°	°	*Ins.*
Fox Creek	93	66	78.0	2.27
Glasgow	98	66	78.1	4.42
Harrisonville	102	66	82.0	1.48
Hermann	.....	.....	.....	5.63
Ironton	87	52	70.4	3.95
Kansas City	101	60	80.6	4.75
Kirksville	96	64	77.3	10.48
Lamonte	106	63	.....	1.44
Mexico	101	62	.....	3.29
Miami	103	58	79.5	4.45
Oregon	94	59	78.3	5.76
Princeton	104	65	83.8	5.95
Saint Charles *a*	99	61	78.9	1.79
Saint Charles *b*	.....	.....	.....	1.80
Savannah	.....	.....	.....	5.05
Sedalia	103	63	82.8	1.65
Springfield	99	62	77.5	0.50
Steelville	96	54	77.7	2.33
Westport	.....	.....	.....	1.20
Montana.				
Fort Keogh	106	55	.....	1.02
Fort Shaw	103	40	70.1	.....
Virginia City	96	42	64.0	0.55
Nebraska.				
Ashland	.....	.....	78.5	2.31
Crete	100	56	78.1	2.15
Creighton	.....	.....	83.3	.....
Culbertson	102	56	83.4	1.12
De Soto *	99	54	77.7	5.37
Fairbury	99	76	89.8	2.78
Falls City	102	60	80.0	4.39
Fort Niobrara	103	50	76.0	2.08
Fort Robinson	101	48	.....	1.45
Fort Sidney	104	42	75.7	0.78
Fremont*	98	58	76.8	3.38
Genoa	97	55	76.7	7.14
Hay Springs	101	52	77.2	3.09
Kimball	105	45	.....	2.79
Lincoln	94	44	.....	4.74
Marquette	101	64	.....	3.21
Nebraska City	99	61	78.6	3.43
North Loup	.....	.....	75.5	.....
Palmer	.....	.....	80.2	2.20
Ravenna	.....	.....	.....	5.28
Red Willow	.....	.....	.....	1.04
Sargent	.....	.....	75.0	5.63
Syracuse	98	64	80.1	4.68
Weeping Water	.....	.....	77.3	1.50
West Hill	.....	.....	77.8	4.68
West Point	.....	.....	.....	2.92
Nevada.				
Austin	93	25	.....	0.09
Battle Mountain	.....	.....	75.8	0.22
Beowawe	.....	.....	80.1	.....
Browns	.....	.....	81.8	T.
Eldorado Canyon	113	69	.....	0.83
Elko	103	30	.....	0.98
Ely	101	36	.....	1.13
Eureka	100	46	.....	0.76
Fort McDermit	99	43	74.1	T.
Lewers' Ranch	90	43	71.8	0.46
Lovelocks	.....	.....	79.3	.....
Mill City	.....	.....	79.0	.....
Pioche	96	40	.....	0.33
Pyramid Agency	95	42	.....	0.00
Rioville	.....	.....	.....	0.06
Reno	92	41	.....	0.44
Ruby Hill	88	44	.....	0.11
Stillwater	102	45	.....	0.00
Verdi	.....	.....	70.7	0.48
Wadsworth	.....	.....	78.7	.....
Wellington	86	40	.....	0.81
Winnemucca	101	37	.....	0.07
New Hampshire.				
Antrim	.....	.....	.....	1.87
Ashland	.....	.....	.....	1.78
Belmont	.....	.....	.....	0.91
Berlin Falls	88	36	61.1	.....
Berlin Mills	93	35	62.3	2.18
Bristol	.....	.....	.....	1.47
Concord	85	49	66.7	0.96
Hanover	84	46	66.8	1.99
Lake Village	.....	.....	.....	1.61
Manchester *a*	87	46	68.2	1.70
Manchester *b*	87	48	67.3	1.74
Manchester *c*	87	48	66.7	1.63
Nashua	88	45	67.9	1.63
North Conway	88	40	65.4	2.16
Plymouth	91	41	65.4	1.58
Stratford	94	41	67.5	1.75
Walpole	84	45	65.0	3.23
West Milan	90	36	62.2	2.18
Wier's Bridge	.....	.....	.....	1.13
Wolfeborough	.....	.....	.....	1.45
New Jersey.				
Beverly	93	54	71.7	4.61
Billingsport L. H.	86	60	74.8	.....
Bridgeton	90	61	73.9	2.39
Cape May, C. H.	92	54	71.1	.....
Clayton *	95	55	71.3	3.70
Egg Harbor City	92	50	69.4	3.87
Freehold	90	50	69.1	3.20
Gillette	94	47	69.2	1.25
Hanover	92	45	67.7	4.00
Highland Park	91	51	69.9	3.08
New Jersey—Cont'd.	°	°	°	*Ins.*
Hopewell	.....	.....	.....	3.21
Imlaystown	92	52	70.0	4.00
Lambertville	99	54	70.5	4.74
Locktown	92	52	70.7	2.40
Moorestown	91	54	70.6	7.03
New Brunswick *a*	88	56	.....	2.66
New Brunswick *b*	89	52	70.0	3.42
New Brunswick *c*	89	52	69.9	3.15
Newark	90	56	72.7	2.06
Ocean City	92	60	72.3	3.50
Oceanic	96	56	74.4	5.16
Rancocas	.....	.....	.....	6.80
Readington *	94	64	73.7	.....
Somerville	88	51	69.9	2.77
South Orange	89	53	69.4	2.62
Tenafly	95	45	70.2	2.47
Tom's River	89	49	70.2	2.87
Trenton	93	60	76.0	5.82
Union	88	56	69.3	2.88
Vineland	91	53	73.5	3.54
New Mexico.				
Coolidge	.....	.....	.....	1.60
Fort Bayard	.....	.....	75.0	4.79
Fort Selden	105	60	82.8	3.84
Fort Union	98	48	72.7	4.36
Fort Wingate	93	48	69.4	2.02
Gallinas Spring	95	63	72.2	2.14
Las Vegas	90	51	69.9	3.54
New York.				
Ardenia	91	61	72.0	1.81
Auburn	86	48	67.2	2.74
Boyd's Corners	94	59	71.5	2.24
Carmel	90	47	68.7	2.22
Cooperstown	88	52	66.0	1.52
Eden	88	50	70.0	1.82
Factoryville	89	42	67.4	2.12
Fort Columbus	89	55	72.1	1.22
Fort Niagara	83	52	67.5	.....
Geneva	.....	.....	65.6	0.93
Humphrey	89	50	69.1	2.42
Ithaca	93	48	68.4	2.33
Lyons	89	50	68.0	1.69
Madison Barracks	91	40	.....	2.24
Palermo *	90	41	67.0	3.13
Palmyra	92	54	70.8	.....
Penn Yan	.....	.....	.....	0.73
Plattsburg B'ks	90	37	70.0	1.12
Rose	84	56	65.1	1.88
Savona	89	42	.....	1.60
Setauket	87	53	69.2	1.61
Utica	96	34	65.9	3.06
West Point	92	50	.....	3.15
White Plains	81	64	69.9	1.58
North Carolina.				
Goldsborough	100	62	.....	1.80
Hot Springs	92	60	74.9	.....
Lenoir	91	62	77.2	2.60
Lumberton	102	57	.....	5.33
Marion	95	65	.....	1.50
Monroe	99	60	78.4	3.00
New Berne	.....	.....	59	1.63
Salisbury	100	66	80.0	1.98
Statesville *	93	62	76.8	5.18
Tarborough	100	57	77.3	1.62
Wadesborough	.....	60	.....	2.60
Weldon *	98	52	76.6	1.46
Ohio.				
Akron	90	47	70.2	4.31
Athens	88	50	72.4	7.54
Bangorville	91	49	70.1	3.73
Bellevue	90	54	.....	2.32
Canton	91	46	70.1	4.78
Celina	92	52	73.0	1.30
Clarksville	92	54	73.9	2.87
Cleveland	89	51	70.0	2.92
College Hill*	97	65	78.0	3.75
Collinwood	86	49	68.9	3.09
Dayton	97	53	76.4	3.44
Elyria	95	48	82.8	3.58
Garrettsville	89	41	66.4	2.75
Georgetown	98	56	.....	4.98
Greenville	89	52	72.2	3.09
Hanging Rock	94	49	71.4	2.82
Hiram	89	44	71.5	2.89
Jacksonborough	86	60	75.3	3.05
Jefferson	86	44	66.6	4.28
Logan	92	51	71.7	7.25
Lordstown	86	46	68.4	4.54
Marietta	91	53	.....	10.48
McConnelsville	91	50	71.4	5.25
Napoleon	90	48	75.3	2.04
New Alexandria	90	46	70.7	6.42
New Athens	86	50	.....	.....
New Comerstown	90	49	71.3	9.62
North Lewisburg	96	53	75.3	4.15
Oberlin	88	48	70.0	3.64
O. S. University	91	49	72.8	4.72
Paulding	95	46	.....	3.30
Pomeroy	96	52	78.0	6.18
Portsmouth	94	57	73.4	6.46
Quaker City	87	45	72.0	7.32
Ruggles*	90	56	68.8	3.15

Meteorological record of voluntary observers, &c.—Continued.

Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean	Precip'n.
Ohio—Cont'd.	°	°	°	*Ins.*
Sidney	94	53	74.9	3.63
Tiffin *a* *	92	53	71.0	1.79
Upper Sandusky	91	50	73.0	2.84
Washington	93	49	73.1	2.82
Wauseon	94	43	71.6	0.86
Westerville	91	50	70.8	3.79
West Milton	102	55	76.4	8.25
Wooster	.....	43	70.1	4.54
Yellow Springs	92	50	72.4	4.91
Youngstown	92	42	70.4	3.33
Oregon.				
Albany	96	46	65.8	0.83
Bandon *	79	48	59.5	0.12
East Portland*	95	50	.....	0.05
Eola	89	52	59.6	0.73
Fort Klamath	93	41	64.1	0.84
La Grande	94	43	.....	1.00
McMinnville	93	39	62.0	0.50
Mount Angel	90	43	68.4	0.78
Yaquina Lt. House	78	40	57.4	1.34
Pennsylvania.				
Altoona	89	50	71.3	2.73
Bethlehem	90	50	73.0	2.73
Carlisle	96	54	71.8	3.43
Catawissa	92	49	75.0	2.48
Chambersburg	94	47	69.7	2.90
Coatsville	93	50	69.8	3.91
Corry *	89	37	66.7	2.61
Coudersport	86	38	66.8	1.40
Drifton	89	46	66.0	2.16
Dyberry	85	39	63.7	4.19
Eagle's Mere	80	44	64.0	3.92
Easton	.....	.....	.....	2.83
Emporium	90	43	71.2	2.17
Franklin *	86	51	66.8	2.77
Girardville	89	.....	69.0	3.34
Grampian Hills	86	45	67.5	3.66
Hamilton	73	55	66.3	3.09
Hollidaysburgh	93	44	68.7	3.73
Honesdale	84	41	64.0	3.75
Huntingdon	94	45	72.2	3.61
Indiana	89	43	68.0	7.04
Johnstown	92	48	67.8	4.33
Lancaster	93	57	72.2	4.12
Lebanon	91	48	70.0	2.50
Lock Haven	93	46	70.4	4.75
Meadville	85	59	77.9?	.....
McConnellsburg	91	47	69.5	2.68
Montrose	89	57	72.9	2.38
New Bloomfield	92	45	68.3	2.47
New Castle	90	41	71.7	4.90
Phillipsburg	90	46	65.6	4.13
Pottstown	93	54	73.0	3.31
Quakertown	94	47	69.5	3.44
Reading	94	43	72.0	2.50
Shamokin	90	45	70.0	2.47
Smithport	86	39	66.6	1.41
Somerset	94	42	64.3	4.30
State College	86	45	69.2	2.78
Stroudsburg	90	44	70.7	3.44
Swarthmore Col	92	53	71.3	2.94
Troy	87	51	66.8	2.80
Uniontown	88	56	72.3	7.10
Wellsborough	90	40	65.6	3.50
West Chester	92	52	70.8	4.47
Westtown	92	52	69.5	3.63
Wysox	90	41	68.7	2.31
York	94	45	71.3	2.84
Rhode Island.				
Bristol	84	52	66.9	3.02
Newport	84	54	66.8	.....
Olneyville	90	50	70.6	.....
Woonsocket	88	52	68.5	2.51
South Carolina.				
Abbeville	100	62	80.0	5.09
Allendale	100	60	.....	1.50
Batesburg	101	62	.....	2.53
Blackville	100	59	.....	3.92
Brewer's Mine	107	60	79.2	2.44
Bucksville	.....	.....	75.7	5.05
Camden	.....	.....	81.8	2.70
Cedar Springs	99	59	77.6	3.66
Cheraw	104	59	.....	3.49
Chester	108	65	.....	3.22
Clinton	104	64	.....	1.97
Conway	.....	.....	.....	4.25
Evergreen	100	63	.....	4.44
Florence	104	58	.....	5.09
Georges	102	56	.....	4.02
Greenwood	100	63	.....	2.75
Hardeeville	102	62	.....	3.14
Jacksonborough	102	53	.....	4.17
Kirkwood	88	66	77.1	2.70
Newberry	99	63	81.2	2.19
Spartanburg	99	60	.....	3.22
Stateburg *	97	65	77.9	4.10
Saint Matthews	100	61	.....	5.73
Timmonsville	95	71	.....	5.22
Trial	98	65	76.0	4.68
Wainsborough	98	60	80.0	2.66
S. Carolina—Cont'd.	°	°	°	*Ins.*
Williamstown	97	66	78.1	3.81
Windsor	101	78	80.0	2.57
Yorkville	98	61	80.0	2.12
Tennessee.				
Andersonville	93	58	76.2	3.14
Ashwood	95	65	80.0	4.27
Austin	97	68	80.9	1.99
Beech Grove	93	66	77.0	3.11
Covington	94	68	80.1	1.56
Fayetteville	96	67	78.8	1.82
Florence Station	91	69	79.0	3.26
Fostoria	85	58	74.6	5.00
Greeneville	89	61	74.0	2.40
Hohenwald	102	54	75.7	2.48
Kingston Springs	95	56	78.4	2.83
Lawrenceburg	95	65	76.0	0.55
Lewisburg	93	67	79.9	1.86
Maryville	93	67	77.0	3.62
Milan	97	64	80.0	1.49
Nunnelly	94	57	76.6	1.06
Riddleton	92	60	76.7	4.15
Rogersville	93	62	76.4	2.52
Savannah	96	60	77.8	1.99
Trenton	93	58	78.4	1.18
Watkins	100	68	78.0	2.78
Waynesborough	97	55	76.4	3.90
Woodstock	98	72	83.0	1.75
Texas.				
Cedar Hill	101	73	.....	2.50
Cleburne *	92	61	78.3	1.36
Colorado City	100	68	.....	.....
Comanche	101	63	81.7	0.94
Corsicana	.....	.....	.....	3.48
Decatur	98	68	80.3	2.16
Fort McIntosh	103	70	88.7	0.21
Fort Ringgold	104	69	86.2	0.28
Gallinas	99	57	81.3	1.94
Lampasas	97	59	81.0	1.24
Mesquite	103	64	79.9	1.84
Mexia	95	70	82.2	2.20
New Ulm	94	67	81.6	1.74
Silver Falls	101	64	83.9	T.
Vermont.				
Burlington	88	49	71.3	1.47
Brattleborough *a*	89	46	66.9	1.43
Brattleborough *b*	87	50	67.3	.....
Chelsea	78	44	61.0	2.74
Jacksonville	87	42	64.4	2.63
Lunenburgh	84	42	66.8	1.20
Manchester	84	54	66.9	1.98
Middlebury	82	52	60.1	1.62
Newport	90	54	68.8	2.20
Northfield	85	41	63.2	1.30
Saint Johnsbury	89	48	.....	1.05
Strafford *	84	52	68.8	3.00
Vernon	90	54	68.9	1.16
Virginia.				
Birdsnest *	93	64	74.7	2.45
Christiansburgh	92	51	.....	1.41
Dale Enterprise *	96	50	76.4	3.61
Fort Monroe	.....	59	.....	3.08
Marion	91	51	72.0	2.05
Petersburg	93	52	83.1?	7.00
Rappahannock	90	49	53.9?	5.76
Summit*	92	51	71.0	.....
University of Va	82	64	73.2	3.08
Wytheville	89	49	74.0	1.83
Washington Territory				
Blakely	87	45	62.5	1.48
Fort Spokane	102	41	71.2	0.04
Fort Townsend	78	48	63.1	4.41
Fort Walla Walla	104	48	76.4	0.42
Tacoma	82	55	65.0	1.16
Vashon	90	42	67.8	1.39
West Virginia.				
Clarksburg*	91	48	74.5	9.59
Hartmonsville	84	50	.....	.....
Helvetia *	86	43	68.0	6.28
Parkersburg	90	53	72.6	9.73
White Sulph. Sgs	.....	.....	.....	1.67
Wisconsin.				
Beloit	92	53	70.6	4.55
Delavan	88	54	69.8	2.25
Deuster	98	47	.....	4.50
Embarras *	90	53	70.0	3.30
Fond du Lac	92	48	69.4	6.37
Fredonia	96	55	69.5	.....
Lancaster	96	48	71.0	2.91
Madison	89	53	71.8	2.26
Manitowoc	90	48	67.5	3.62
Wauconsta	.....	44	.....	.....
Wyoming.				
Camp Sheridan	95	38	64.1	.....
Fort Laramie	109	49	76.2	1.30
Fort McKinney	93	46	68.4	3.63
Fort Washakie	99	43	69.2	1.04

Table of miscellaneous meteorological data for July, 1888—Signal Service observations.

Stations and districts.	Elevation above sea-level, feet.	Atmospheric pressure: Mean actual barometer.	Atmospheric pressure: Departure from normal.	Atmospheric pressure: Mean reduced barometer.	Extremes: Highest barometer.	Date.	Extremes: Lowest barometer.	Date.	Monthly range of barometer.	Temperature: Monthly mean.	Temperature: Departure from normal.	Extremes: Max.	Date.	Mean max.	Min.	Date.	Mean min.	Monthly range.	Daily ranges: Greatest.	Date.	Least.	Date.	Mean relative humidity, per cent.	Mean temperature of dew-point, degrees Fahrenheit.	Precipitation, in inches.	Departure from normal precipitation, in inches.	Winds: Total movement, miles.	Prevailing direction.	Maximum velocity: Miles p. h.	Direction.	Date.	No. of rainy days.	No. of cloudy days.	No. of fair days.	No. of clear days.
New England.										65.2	— 4.3														2.55	— 1.56									
Eastport	53	29.87	+.01	29.93	30.36	18	29.21	12	1.15	58.1	— 2.9	77.3	23	67.4	45.2	18	49.9	32.1	26.9	23	7.8	20	82.6	52.5	3.46	— 1.29	5,145	sw.	36	s.	12	15	10	9	12
Portland	99	29.84	+.03	29.94	30.29	18	29.20	12	1.09	65.5	— 3.5	87.1	5	73.3	50.5	12	57.1	36.6	27.5	30	7.4	27	72.6	56.0	1.90	— 1.97	5,603	s.	35	w.	12	12	9	10	12
Manchester	247	29.72	......	29.97	30.28	18	29.32	12	0.96	66.7	— 5.3	86.7	5	78.3	48.0	18	56.1	38.7	32.5	3	9.8	19	78.3	56.1	1.63	......	3,985	nw.	28	w.	12	9	6	14	11
Mt. Washington	6,279	23.85	—.02	29.98	30.32	17	29.16	12	1.16	43.7	— 4.3	63.7	4	50.7	24.2	12	39.0	39.5	23.7	12	4.3	1	84.4	38.9	6.58	— 4.33	21,155	nw.	120	nw.	12	15	18	9	4
Northfield	871	29.05	......	29.97	30.26	29	29.31	11	0.95	63.2	— 6.8	85.0	4	75.4	40.7	2	50.4	44.3	36.6	4	9.7	1	81.2	57.1	1.30	......	6,059	sw.	38	sw.	12	7	6	10	15
Boston	125	29.85	+.03	29.99	30.30	18	29.39	12	0.91	68.3	— 2.7	88.0	23	77.4	51.0	1	60.1	37.0	26.9	4	7.7	18	68.0	56.8	1.79	— 1.85	8,027	w.	42	w.	12	9	10	11	10
Nantucket	14	29.97	......	29.98	30.26	17	29.46	12	0.80	63.8	— 6.2	78.3	7	72.0	51.0	1	58.3	27.3	20.8	11	6.2	3	72.0	58.3	3.68	......	7,300	sw.	37	ne.	1	8	9	9	13
Wood's Holl	22	29.94	......	29.96	30.23	18	29.40	12	0.83	64.2	— 5.8	78.5	7	70.6	51.5	3	60.2	27.0	19.5	3	4.4	31	85.4	59.4	5.03	+ 1.80	10,253	sw.	48	sw.	12	7	3	5	18
Vineyard Haven	......	......	......	......	......	..	......	..	....	68.1	......	86.5	24	77.5	52.0	4	58.7	34.5	27.0	7	5.0	28	....	......	4.51	......	......	sw.	...	......	..	10	..	..	..
Narragansett Pier	22	......	......	......	......	..	......	..	....	66.8	......	88.0	7	76.1	48.0	3	57.5	40.0	28.0	25	10.0	28	....	......	1.97	......	......	sw.	...	......	..	7	..	..	..
New Haven	107	29.89	+.04	30.00	30.27	17	29.54	12	0.73	68.3	— 2.7	89.8	7	77.8	50.6	18	59.7	39.2	26.9	3	7.7	19	76.0	60.2	1.76	— 2.99	4,802	ne.	27	w.	12	11	8	10	13
New London	47	29.93	+.01	29.98	30.25	17	29.46	12	0.79	68.5	— 2.5	86.5	7	75.7	53.5	18	61.1	33.0	22.5	7	8.0	27	74.0	59.6	1.35	— 3.00	4,172	sw.	24	sw.	12	10	5	18	8
Mid. Atlantic States.										72.2	— 3.4														2.93	— 1.52									
Albany	85	29.90	+.05	29.99	30.28	3	29.38	11	0.90	70.3	— 2.7	90.0	22	82.0	52.0	15	59.7	38.0	31.0	22	13.2	9	70.3	59.8	2.52	— 1.69	3,750	s.	45	n.	5	8	7	7	17
New York City	185	29.82	+.03	30.01	30.26	17	29.60	12	0.66	70.5	— 2.5	89.9	7	81.5	55.3	13	63.6	34.6	25.1	11	9.8	19	69.9	59.7	1.27	— 3.23	6,225	s.	48	nw.	1	9	7	13	11
Philadelphia	117	29.91	+.05	30.03	30.26	17	29.66	12	0.60	72.1	— 3.9	93.8	7	83.1	56.8	13	62.6	37.0	25.8	5	8.5	1	66.4	59.6	3.38	— 1.03	6,771	nw.	34	ne.	28	11	11	8	12
Atlantic City	34	30.00	+.05	30.02	30.23	18	29.66	12	0.57	69.6	— 3.4	91.0	7	76.8	54.8	13	63.7	36.2	21.0	7	4.8	29	81.5	63.5	2.44	— 0.83	6,149	sw.	24	sw.	13	11	9	12	10
Baltimore	45	29.99	+.05	30.03	30.24	3	29.67	12	0.57	73.8	— 3.2	94.3	7	82.8	56.8	13	66.4	37.5	24.5	11	4.6	30	68.0	62.0	2.82	— 1.96	3,806	s.	23	w.	12	8	7	11	13
Washington City	106	29.93	+.05	30.05	30.27	3	29.64	12	0.63	72.9	— 3.1	93.7	7	82.5	55.5	13	64.6	38.2	25.0	11	6.5	30	77.0	65.0	4.47	— 0.08	3,366	s.	18	sw.	1	10	10	4	17
Cape Henry	......	......	......	......	......	..	......	..	....	75.6	......	98.0	9	84.2	57.4	4	66.9	40.6	27.5	5	7.8	30	....	......	1.66	— 4.15	......	se.	...	......	..	9	..	..	..
Lynchburg	658	29.38	+.05	30.06	30.26	3	29.71	12	0.55	73.9	— 4.1	95.0	7	86.5	55.4	15	64.0	39.6	30.5	24	9.8	10	67.2	61.8	2.59	— 0.65	2,786	se.	20	e.	9	12	5	20	6
Norfolk	69	29.98	.00	30.05	30.26	3	29.70	12	0.56	74.3	— 4.7	94.2	9	84.5	58.3	3	66.8	35.9	26.1	27	8.2	21	75.0	65.6	5.26	— 0.03	4,846	ne.	36	nw.	9	12	4	14	13
Harrisburg	......	29.64	......	30.03	30.23	3	29.68	11	0.55	71.5	......	91.4	7	81.5	54.0	4	63.0	37.4	29.0	4	6.0	1	71.6	62.0	3.27	......	3,885	w.	25	nw.	12	8	11	10	10
S. Atlantic States.										77.5	— 2.8														4.27	— 1.94									
Charlotte	808	29.24	+.04	30.07	30.25	4	29.85	12	0.40	77.5	— 1.5	99.6	12	90.1	60.0	16	67.9	39.6	30.8	12	14.0	20	66.8	64.7	1.68	— 4.59	3,208	ne.	30	nw.	5	11	13	14	4
Hatteras	11	30.06	+.04	30.08	30.28	4	29.80	12	0.48	74.6	— 3.4	85.4	12	80.1	62.0	4	70.0	23.4	20.9	12	4.4	21	84.3	69.4	6.24	— 0.22	7,989	ne.	30	n.	11	7	2	14	15
Kitty Hawk	......	......	......	......	......	..	......	..	....	76.5	......	100.2	10	83.5	59.3	4	69.6	40.9	30.8	13	8.3	22	....	......	3.92	— 2.11	......	e.	...	......	..	9	..	..	..
Raleigh	375	29.66	......	30.05	30.25	3	29.77	12	0.48	75.8	— 3.2	101.0	12	89.5	58.0	14	67.4	43.0	31.0	7	12.5	20	73.5	66.6	4.93	......	3,154	n.	24	ne.	25	11	8	12	11
Southport	......	......	......	......	......	..	......	..	....	77.9	......	92.0	13	85.1	62.5	15	70.7	29.5	22.0	19	7.0	26	....	......	3.72	— 2.81	......	sw.	...	......	..	9	..	..	..
Wilmington	52	29.99	+.01	30.05	30.26	4	29.82	13	0.44	75.9	— 4.1	95.9	12	86.0	59.8	3	68.9	36.1	25.4	12	5.5	29	81.9	69.8	5.87	— 1.26	4,448	e.	30	nw.	10	11	9	11	11
Charleston	52	30.01	+.02	30.06	30.26	4	29.84	13	0.42	78.5	— 3.5	100.2	13	87.1	67.5	4	73.3	32.7	23.7	13	6.6	3	80.2	71.6	6.06	— 1.13	6,263	sw.	35	se.	31	10	5	13	13
Columbia	......	......	......	......	......	..	......	..	....	79.5	......	100.6	12	91.0	62.8	16	70.0	37.8	30.6	12	10.0	30	73.3	69.0	4.57	......	......	......	...	......	..	11	6	19	6
Augusta	183	29.88	+.03	30.07	30.29	4	29.85	13	0.44	79.2	— 1.8	103.8	8	93.4	65.0	16	70.9	38.8	30.0	12	7.9	20	72.2	69.4	1.79	— 3.13	2,498	ne.	33	sw.	10	8	14	10	6
Savannah	87	29.96	.00	30.05	30.26	4	29.85	13	0.41	78.5	— 3.5	99.1	8	89.5	66.9	18	71.9	32.2	26.3	8	9.8	3	77.7	70.8	0.82	— 4.33	4,757	se.	28	nw.	10	4	7	17	7
Jacksonville	43	29.99	—.02	30.04	30.21	4	29.88	13	0.33	80.2	— 1.8	98.4	13	90.4	68.0	5	73.4	30.4	24.7	1	8.8	11	74.8	71.1	8.30	+ 2.10	3,961	ne.	22	sw.	10	13	2	18	16
Florida Peninsula.										82.0	— 1.4														6.58	— 0.12									
Titusville	12	30.05	......	30.06	30.20	4	29.93	13	0.27	80.8	......	95.0	13	87.8	68.0	7	73.0	27.0	22.0	13	7.2	4	79.0	73.6	5.62	......	5,385	e.	24	e.	21	14	5	10	16
Cedar Keys	22	30.02	—.02	30.05	30.20	4	29.94	13	0.26	80.8	— 1.2	90.7	15	88.2	71.3	21	76.3	19.4	16.7	21	6.0	10	79.0	73.5	4.11	— 4.98	5,001	ne.	37	n.	15	13	9	14	8
Key West	22	30.03	—.01	30.05	30.17	10	29.96	26	0.21	83.3	— 1.7	90.5	16	87.8	68.2	16	76.4	22.3	22.3	16	6.9	13	77.7	75.4	9.04	+ 4.73	4,031	e.	30	w.	22	19	10	15	5
Jupiter	28	30.02	......	30.05	30.17	10	29.96	26	0.21	81.0	......	94.0	12	88.1	69.0	16	74.8	25.0	17.9	12	9.6	6	84.1	75.8	3.72	......	4,161	se.	24	s.	25	13	5	6	20
Sebastian	......	......	......	......	......	..	......	..	....	82.8	......	97.0	11	92.5	68.0	7	73.0	29.0	22.8	1	10.0	17	....	......	8.04	......	......	w.	...	......	..	..	..	..	..
Eastern Gulf States.										80.5	— 0.1														3.06	— 2.22									
Atlanta	1,129	28.91	+.01	30.08	30.26	4	29.93	13	0.33	76.9	— 1.1	94.5	7	88.4	65.3	18	69.9	29.2	23.7	28	10.8	19	73.5	67.2	1.85	— 2.57	5,147	nw.	26	w.	10	11	3	22	6
Pensacola	56	29.98	—.04	30.04	30.16	4	29.95	30	0.21	82.0	+ 1.0	94.0	4	88.7	72.3	28	75.7	21.7	18.0	23	8.0	18	76.8	73.8	2.20	— 3.84	5,908	sw.	24	sw.	31	7	5	12	14
Mobile	35	30.01	.00	30.05	30.18	4	29.94	13	0.24	80.5	— 0.5	96.6	14	90.7	68.5	27	74.2	28.1	22.8	28	11.7	5	81.6	74.2	5.36	— 0.76	4,241	s.	36	s.	24	12	5	20	6
Montgomery	217	29.81	.00	30.04	30.21	4	29.94	13	0.27	81.5	+ 0.5	97.6	14	92.5	67.2	21	72.9	30.4	25.5	27	13.3	3	68.0	69.6	3.86	— 0.56	2,956	w.	28	sw.	10	8	6	20	5
Vicksburg	222	29.79	—.03	30.02	30.14	7	29.83	1	0.31	80.8	— 0.2	97.0	14	92.3	65.3	22	73.2	31.7	23.7	22	15.1	9	78.8	73.1	3.04	— 1.09	3,113	e.	25	s.	18	8	6	17	8
University	......	......	......	......	......	..	......	..	....	81.6	......	95.8	14	91.5	63.8	21	71.6	32.0	24.8	22	13.2	19	....	......	3.37	......	......	nw.	...	......	..	9	..	..	..
New Orleans	52	29.97	—.01	30.03	30.14	10	29.88	1	0.26	81.5	— 0.5	96.5	15	90.7	72.0	16	76.4	24.5	19.0	27	7.5	5	76.8	73.2	2.02	— 4.49	4,458	se.	36	s.	16	13	2	12	17
Auburn	......	......	......	......	......	..	......	..	....	80.0	......	93.0	29	87.3	66.0	21	72.6	27.0	21.0	29	6.0	3	....	......	4.55	......	......	nw.	...	......	..	5	..	..	..
Western Gulf States.										81.2	— 0.8														2.96	— 0.28									
Shreveport	249	29.76	—.02	30.00	30.14	20	29.86	1	0.28	81.4	— 1.6	98.5	14	92.4	66.9	21	73.1	31.6	24.3	24	9.3	6	74.8	72.2	2.97	— 0.94	3,112	s.	42	se.	19	10	3	20	8
Fort Smith	470	29.53	+.03	30.02	30.21	20	29.88	2	0.33	80.6	+ 0.6	99.5	30	92.6	63.4	21	71.4	36.1	26.7	20	11.0	9	75.6	71.7	4.31	+ 1.08	1,949	se.	21	sw.	6	8	6	11	14
Little Rock	309	29.72	+.03	30.03	30.20	20	29.92	16	0.28	81.3	+ 1.3	97.3	13	91.0	65.6	22	78.2	31.7	22.5	23	8.2	18	71.2	72.8	3.78	+ 0.67	2,721	sw.	24	ne.	16	10	3	15	13
Corpus Christi	20	29.99	—.01	30.01	30.12	20	29.87	1	0.25	82.0	— 1.0	89.8	21	87.2	72.8	18	76.0	17.0	15.0	17	7.1	27	80.6	75.3	2.25	......	7,726	se.	27	se.	9	4	3	9	19
Galveston	44	29.98	—.01	30.02	30.12	11	29.78	5	0.34	82.0	— 2.0	91.3	19	87.4	73.5	4	78.6	17.8	13.3	4	4.0	18	76.4	73.1	1.54	— 1.72	6,851	sw.	42	e.	5	6	6	7	18
Palestine	533	29.48	—.01	30.03	30.17	20	29.88	1	0.29	79.8	— 1.2	94.5	13	89.8	63.9	23	72.1	30.6	25.1	24	8.0	10	79.2	72.2	4.39	+ 1.56	4,871	s.	26	ne.	6	8	6	9	16
San Antonio	781	29.22	—.03	30.02	30.16	20	29.86	1	0.30	81.0	— 2.0	95.2	31	93.1	64.3	22	71.6	30.9	27.0	24	15.8	7	67.2	67.6	0.79	— 2.36	5,291	se.	30	ne.	5	3	2	21	8
Rio Grande Valley.										82.0	— 2.5														0.97	— 0.84									
Rio Grande City	230	29.80	+.03	30.04	30.16	20	29.89	1	0.27	82.4	— 3.6	99.4	20	96.9	70.8	18	74.5	28.6	26.7	20	16.6	27	74.4	72.4	0.64	— 0.76	5,359	se.	...	......	..	2	4	5	22
Brownsville	57	29.95	+.02	30.01	30.11	11	29.87	1	0.24	81.6	— 1.4	93.8	20	90.8	72.0	19	76.1	21.8	20.7	19	10.0	27	82.3	75.4	1.30	— 0.92	5,429	se.	24	e.	21	5	0	13	18
Ohio Val. & Tenn.										76.2	— 0.8														3.28	— 0.89									
Chattanooga	783	29.24	.00	30.05	30.19	4	29.91	13	0.28	78.0	+ 1.0	95.7	7	89.6	65.5	22	70.2	30.2	24.5	22	9.5	10	75.0	69.3	2.07	— 1.79	3,241	nw.	25	w.	9	6	10	17	4
Knoxville	980	29.05	.00	30.07	30.21	4	29.94	12	0.27	75.6	— 0.4	93.0	7	87.4	60.4	14	67.2	32.6	32.1	31	7.7	10	76.6	67.2	3.45	— 1.09	3,149	e.	36	n.	7	9	3	14	14
Memphis	320	29.69	.00	30.03	30.16	20	29.91	13	0.25	80.7	— 0.3	97.2	14	91.8	66.4	21	73.2	30.8	23.9	27	12.8	10	72.4	70.8	2.12	— 1.02	2,923	n.	19	w.	9	8	7	16	8
Nashville	549	29.46	+.02	30.03	30.13	7	29.89	9	0.24	78.1	+ 0.1	96.8	7	90.0	62.0	21	69.6	34.8	27.7	22	8.2	18	90.0	69.6	2.36	— 2.40	3,412	w.	30	sw.	8	12	4	20	7
Louisville	551	29.46	+.03	30.03	30.16	21	29.84	12	0.32	77.8	— 0.2	95.6	7	88.4	60.8	14	68.9	34.8	26.4	23	10.8	18	63.4	63.8	3.59	— 0.41	4,436	ne.	24	sw.	27	9	5	11	15
Indianapolis	766	29.25	+.04	30.06	30.20	20	29.82	9	0.38	75.2	— 0.8	94.8	31	86.3	57.5	15	65.2	37.3	27.2	30	4.2	9	64.6	61.8	3.33	— 1.75	2,439	ne.	9	sw.	20	7	6	13	12
Terre Haute	......	......	......	......	......	..	......	..	....	76.5	......	94.6	7	86.2	58.5	21	66.8	36.1	25.4	31	13.1	13	....	......	3.31	......	......	e.	...	......	..	6	..	..	..
Cincinnati	628	29.37	+.02	30.03	30.18	21	29.80	12	0.38	76.2	— 0.8	95.4	7	87.4	58.2	15	66.8	37.2	27.6	1	10.2	18	62.7	61.7	2.46	— 1.26	4,225	se.	24	w.	1	8	5	14	12
Columbus	812	29.20	+.04	30.05	30.21	21	29.82	12	0.39	72.8	— 2.2	90.8	7	83.1	52.8	13	63.2	38.0	25.5	17	9.4	9	67.3	60.6	5.81	+ 2.32	3,959	ne.	36	nw.	8	11	2	14	15
Pittsburg	847	29.15	+.04	30.02	30.19	21	29.78	12	0.41	71.7	— 3.3	90.3	4	82.4	50.5	13	62.4	39.8	27.1	25	6.3	9	66.4	59.2	4.36	— 0.63	3,795	nw.	25	w.	12	11	7	17	7
Lexington	......	29.01	......	......	......	..	......	..	....	75.8	......	95.0	7	86.3	56.0	14	65.4	39.0	26.8	22	10.3	18	60.7	60.4	4.21	......	3,592	ne.	19	sw.	12	8	4	12	15
Parkersburg	......	29.51	......	30.05	30.16	25	29.72	12	0.44	71.9	......	91.5	7	84.0	52.0	14	62.1	39.5	31.2	13	9.5	18	74.7	63.0	10.33	......	2,764	nw.	36	e.	8	13	12	2	17
Lower lake region.										69.1	— 1.0														2.63	— 0.86									
Buffalo	690	29.30	+.07	30.03	30.22	28	29.64	11	0.58	68.0	— 1.0	84.0	17	76.0	48.6	13	59.8	35.4	28.0	16	7.3	11	67.3	56.0	2.01	— 1.53	6,517	sw.	48	sw.	11	6	6	16	9
Oswego	335	29.64	+.04	30.00	30.20	29	29.51	11	0.69	65.4	— 3.6	88.6	4	74.3	48.4	15	57.3	40.2	27.0	3	7.5	8	70.0	54.8	2.32	— 1.02	6,037	w.	38	n.	11	5	7	15	9
Rochester	621	29.36	+.06	30.01	30.22	16	29.54	11	0.68	67.7	— 1.3	90.2	4	77.7	48.0	14	57.8	42.2	27.8	3	10.7	18	53.5	61.6	1.12	— 2.06	3,833	w.	52	nw.	11	8	5	14	12
Erie	681	29.31	+.05	30.03	30.20	28	29.70	11	0.50	69.5	— 1.5	87.0	4	76.9	52.0	12	60.7	35.0	25.7	3	5.9	9	64.5	56.5	3.17	+ 0.06	5,880	nw.	35	w.	11	10	3	16	12
Cleveland	678	29.32	+.06	30.04	30.19	21	29.78	11	0.41	71.0	0.0	88.8	31	79.3	51.2	14	61.9	37.6	28.0	12	6.9	7	79.3	61.9	2.45	— 1.55	4,510	ne.	22	w.	31	7	11	11	9
Sandusky	629	29.38	+.06	30.04	30.18	2	29.80	11	0.38	71.3	— 1.7	90.4	31	80.7	57.0	2	64.1	33.4	27.5	3	8.9	15	69.0	60.0	3.58	+ 0.03	5,575	se.	30	sw.	23	8	8	23	0
Toledo	673	29.33	+.03	30.05	30.19	15	29.81	11	0.38	70.6	— 3.4	89.4	31	82.3	48.6	13	62.0	40.8	30.6	10	7.5	7	71.8	60.7	2.92	— 0.54	5,570	ne.	24	n.	12	7	12	12	7
Detroit	662	29.34	+.06	30.05	30.21	15	29.75	11	0.46	69.5	— 2.5	91.4	11	80.9	50.0	13	61.0	41.4	34.3	12	9.5	9	68.6	58.2	3.48	— 0.30	5,757	ne.	28	w.	11	11	7	15	9
Upper lake region.										67.1	— 0.6														2.62	— 0.72									
Alpena	609	29.37	+.07	30.02	30.22	28	29.70	11	0.52	64.2	— 0.8	88.2	6	73.1	46.2	2	54.6	42.0	33.8	10	6.7	17	74.0	55.1	1.56	— 1.89	5,602	se.	36	nw.	11	11	17	8	6
Escanaba	608	......	......	......	......	..	......	..	....	68.2	......	92.0	10	79.5	46.0	12	56.9	46.0	35.0	10	9.5	28	....	......	1.96	— 1.36	......	w.	...	......	..	15	..	..	..
Grand Haven	620	29.37	+.05	30.02	30.21	20	29.79	11	0.42	67.9	— 0.1	84.0	5	75.8	49.0	13	60.1	35.0	24.4	16	5.4	11	71.1	57.7	1.59	— 1.63	5,802	nw.	30	ne.	8	9	9	12	10
Lansing	883	29.11	......	30.03	30.20	15	29.76	11	0.44	69.9	— 2.1	91.5	30	83.2	48.0	13	58.1	43.5	35.0	16	9.0	9	73.2	60.5	2.00	......	4,055	se.	28	sw.	11	9	6	13	12
Manistee	......	29.36	......	......	......	..	......	..	....	64.9	......	90.3	3	73.5	50.0	13	56.4	40.0	25.9	25	7.0	26	75.6	56.6	4.20	......	3,652	sw.	24	w.	31	9	7	14	10
Marquette	672	29.28	+.05	30.01	30.24	13	29.73	11	0.51	63.6	— 1.4	90.5	3	73.5	46.6	12	55.0	43.9	28.3	25	8.5	27	75.1	55.4	1.32	— 1.78	4,680	se.	36	sw.	30	12	10	12	9
Port Huron	639	29.37	+.08	30.05	30.21	28	29.78	11	0.43	66.7	— 1.3	88.8	11	76.1	49.1	13	58.6	39.7	27.5	24	2.7	9	73.0	57.5	3.24	+ 0.48	6,487	n.	47	w.	11	6	17	16	8
Chicago	715	29.28	+.05	30.02	30.21	20	29.81	12	0.40	72.0	0.0	94.3	31	80.7	56.3	13	64.6	38.0	28.5	12	5.9	27	68.2	60.4	3.93	+ 0.39	6,450	ne.	39	ne.	12	10	12	8	11
Milwaukee	697	29.28	+.04	30.02	30.19	20	29.80	12	0.39	67.5	— 1.5	90.8	11	76.1	52.5	13	60.3	38.3	29.0	10	7.7	14	75.8	59.0	3.48	+ 0.08	4,374	n.	36	nw.	31	14	6	11	14
Green Bay	616	29.36	......	30.02	30.21	20	29.81	11	0.40	69.3	+ 2.3	90.5	11	79.7	51.9	21	59.9	38.6	27.7	24	10.3	27	72.4	59.6	3.13	......	4,835	s.	36	w.	3	12	12	16	3
Duluth	672	29.17	+.04	30.00	30.16	13	29.63	2	0.53	63.2	— 2.8	88.7	10	75.1	45.2	1	51.5	43.5	30.7	10	6.0	27	72.1	53.1	3.86	— 0.05	4,496	ne.	34	ne.	13	11	12	7	12
Sault de St. Marie	......	29.32	......	29.98	30.20	14	29.67	11	0.53	59.9	......	87.8	3	73.0	43.5	14	51.2	44.3	32.6	6	8.8	19	79.8	53.4	1.09	......	4,191	nw.	36	nw.	11	9	10	11	10
Extreme northwest.										67.6	+ 0.2														3.08	— 0.20									
Moorhead	926	28.99	+.04	29.98	30.23	19	29.58	2	0.65	67.7	— 1.3	95.0	11	80.7	47.5	19	57.4	47.5	35.6	12	10.0	1	78.5	60.2	3.48	— 1.37	6,453	n.	42	se.	27	12	7	11	13
Saint Vincent	804	29.09	+.03	29.97	30.22	22	29.47	2	0.75	66.0	+ 1.0	89.0	28	77.0	45.4	24	54.9	43.6	35.0	28	12.6	2	78.0	59.0	2.76	— 0.14	5,526	s.	29	nw.	30	9	10	8	13
Bismarck	1,681	28.22	+.05	29.99	30.24	23	29.63	2	0.61	69.5	+ 0.5	96.0	11	81.1	49.0	23	58.3	47.0	30.5	10	11.1	2	72.0	59.2	3.96	+ 1.51	6,689	e.	47	nw.	30	14	6	14	11
Fort Buford	1,900	27.97	+.04	29.96	30.22	23	29.65	2	0.57	68.8	+ 0.8	95.0	20	81.8	49.0	16	56.4	46.0	40.0	19	14.8	1	63.9	54.6	2.12	— 0.16	6,043	nw.	54	nw.	30	14	9	16	6

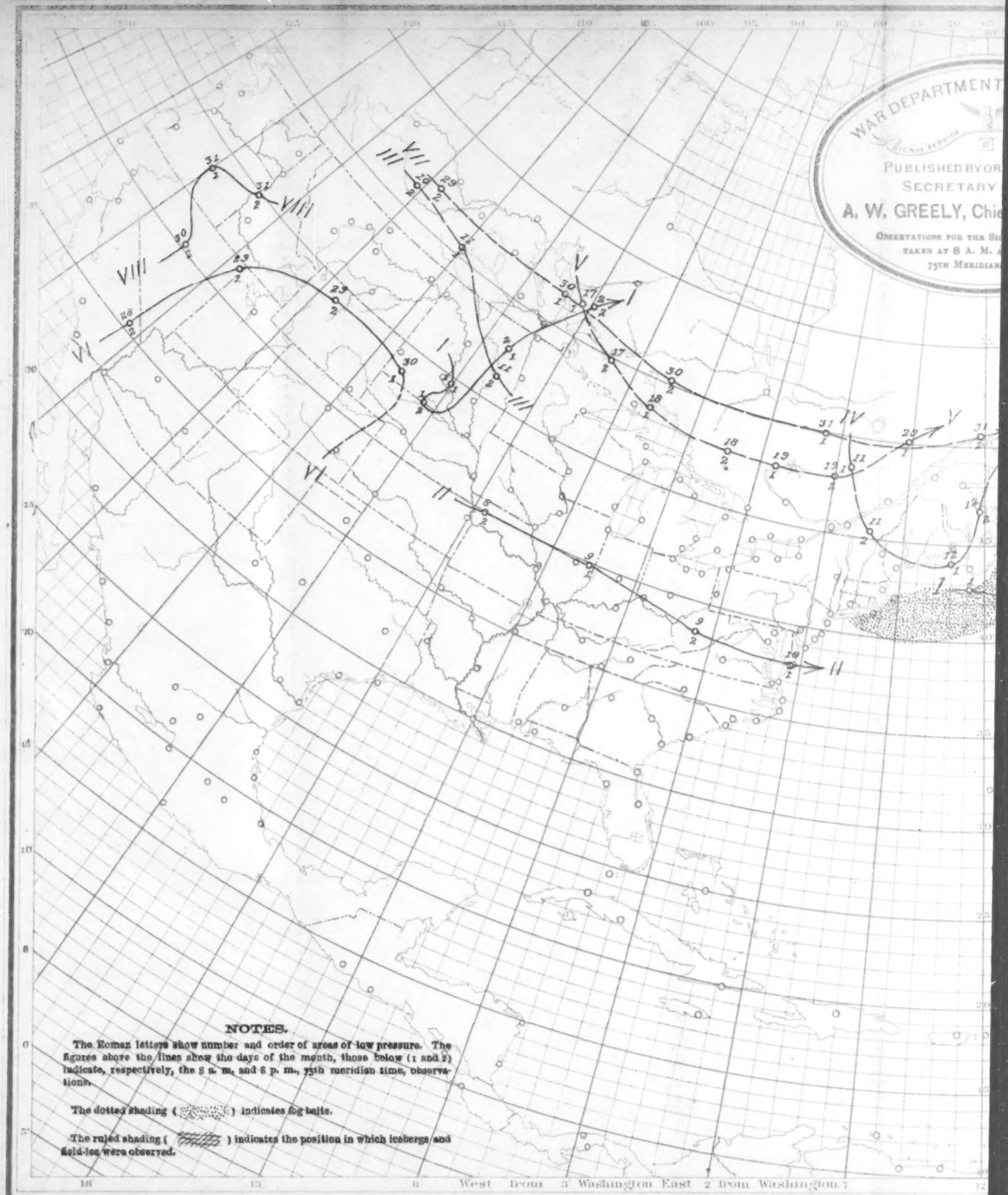
Table of miscellaneous meteorological data for July, 1888—Signal Service observations—Continued.

Stations and districts.	Elevation above sea-level, feet.	Atmospheric pressure, in inches and hundredths. Mean actual barometer.	Departure from normal.	Mean reduced barometer.	Extremes. Highest barometer.	Date.	Lowest barometer.	Date.	Monthly range of barometer.	Temperature of the air, in degrees Fahrenheit. Monthly mean.	Departure from normal.	Extremes. Max.	Date.	Mean max.	Min.	Date.	Mean min.	Monthly range.	Daily ranges. Greatest.	Date.	Least.	Date.	Mean relative humidity, per cent.	Mean temperature of dew-point, degrees Fahrenheit.	Precipitation, in inches.	Departure from normal precipitation, in inches.	Winds. Total movement, miles.	Prevailing direction.	Maximum velocity. Miles p. h.	Direction.	Date.	No. of rainy days.	No. of cloudy days.	No. of fair days.	No. of clear days.
Ex. northwest—Con.																																			
Fort Totten	1,487	28.40	+.06	29.99	30.29	6	29.56	2	0.73	66.1	+ 0.1	88.3	28	78.1	45.6	23	56.5	42.7	31.1	9	14.0	8	76.8	58.2	3.34	− 0.36	8,172	n.	48	se.	29	9	8	6	17
Fort Yates	......	......	.....	......	......	..	......	..	....	72.8	......	102.3	20	84.9	50.6	16	60.6	51.7	41.8	20	12.8	2	......	......	2.70	− 0.71	......	se.	...	......	..	11	..	..	..
Upper Miss. Valley.										**75.3**	**+ 0.1**														**4.49**	**+ 0.72**									
Saint Paul	831	29.10	+.04	29.98	30.20	20	29.65	2	0.55	72.0	+ 1.0	94.0	11	82.6	55.5	4	63.6	38.5	26.5	20	10.9	15	75.0	63.3	5.55	+ 2.26	2,754	sw.	56	w.	30	12	9	16	6
La Crosse	744	29.24	+.07	30.03	30.25	20	29.76	12	0.49	72.0	− 1.0	90.9	11	83.0	56.9	13	64.4	34.0	27.2	3	11.8	18	74.4	62.6	4.55	− 0.27	4,468	s.	35	w.	30	10	6	18	7
Davenport	615	29.36	+.02	30.01	30.21	20	29.85	12	0.36	74.4	− 0.6	95.4	31	85.4	55.0	13	67.1	40.4	23.8	12	11.8	16	76.7	66.2	7.31	+ 3.77	5,074	sw.	42	s.	25	9	9	16	6
Des Moines	866	29.09	+.01	29.99	30.23	20	29.79	2	0.44	75.6	+ 1.6	99.0	31	87.5	56.8	20	66.7	42.2	28.7	13	9.2	25	87.5	66.7	3.42	− 0.22	3,541	s.	30	n.	5	10	6	11	14
Dubuque	665	29.31	+.04	30.02	30.22	20	29.80	12	0.42	74.1	+ 1.1	94.5	6	85.4	54.0	13	65.5	40.5	27.5	20	12.3	9	77.8	66.3	3.59	− 1.29	3,077	nw.	21	n.	29	11	11	8	12
Keokuk	618	29.36	+.03	30.01	30.20	20	29.85	9	0.35	75.7	− 1.3	96.3	31	86.2	60.8	13	68.0	35.5	27.8	13	5.5	9	77.6	68.2	6.00	+ 1.89	4,794	s.	36	nw.	7	15	6	14	11
Cairo	359	29.66	+.02	30.04	30.18	20	29.88	9	0.30	79.5	+ 0.5	95.0	31	88.2	64.8	21	71.9	30.2	20.3	23	9.3	10	72.0	69.2	3.32	− 0.39	3,789	n.	48	sw.	9	6	10	18	3
Springfield, Ill.	644	29.38	+.04	30.05	30.24	20	29.85	9	0.39	75.5	− 0.5	97.1	31	85.9	58.9	14	66.9	38.2	24.4	13	6.9	9	75.9	67.0	4.59	+ 2.49	4,325	s.	40	nw.	4	8	6	17	8
Saint Louis	571	29.42	+.01	30.02	30.21	20	29.86	12	0.35	79.0	0.0	97.9	31	88.6	64.5	15	71.0	33.4	23.0	5	12.0	9	67.0	66.4	2.09	− 1.76	5,902	w.	36	n.	5	9	9	11	11
Missouri Valley.										**75.6**	**+ 1.8**														**3.11**	**− 0.80**									
Lamar	1,028	28.99	.....	30.05	30.26	20	29.90	2	0.35	78.1	......	98.0	31	89.9	59.5	21	68.4	38.5	29.0	22	11.8	9	76.9	69.8	1.17	− 3.10	3,666	s.	24	s.	8	3	5	11	15
Springfield, Mo.	1,356	28.64	+.04	30.02	30.21	20	29.89	16	0.32	77.5	+ 1.5	99.0	31	89.3	61.8	20	68.7	37.2	26.5	21	12.0	8	71.5	67.0	0.50	......	5,090	sw.	24	sw.	8	6	4	14	13
Leavenworth	842	29.13	+.02	29.99	30.23	20	29.81	26	0.42	79.0	+ 2.0	97.0	30	90.4	60.5	23	69.7	36.5	28.6	12	11.1	9	68.8	67.6	4.87	+ 0.27	3,924	s.	36	se.	5	6	5	9	17
Topeka	......	......	.....	......	......	..	......	..	....	77.0	......	99.8	30	91.1	58.5	23	66.9	41.3	32.1	12	15.4	16	81.6	70.5	3.00	......	......	......	...	......	..	8	6	10	15
Omaha	1,113	28.86	+.03	30.02	30.25	19	29.82	12	0.43	77.6	+ 1.6	101.2	30	89.8	60.0	17	68.5	41.2	31.0	13	15.1	9	71.5	67.0	2.56	− 3.04	5,213	s.	37	nw.	14	10	10	11	10
Crete	......	......	.....	......	......	..	......	..	....	76.7	......	99.6	12	89.4	55.9	17	66.7	43.7	32.4	12	11.7	24	77.4	68.6	2.15	......	......	......	...	......	..	8	8	8	15
Valentine	2,614	......	.....	29.96	30.27	22	29.54	1	0.73	73.6	+ 1.6	102.9	11	87.9	49.0	19	61.0	53.9	42.0	19	13.6	8	67.7	60.8	4.83	+ 2.55	7,355	n.	54	nw.	22	10	6	14	11
Fort Sully	1,600	27.32	+.02	29.99	30.22	22	29.65	2	0.57	74.5	+ 1.5	103.8	11	88.2	51.8	16	62.7	52.0	38.9	20	14.2	8	61.7	58.7	3.47	+ 0.92	6,623	e.	30	ne.	29	10	3	12	16
Huron	1,307	28.29	+.02	30.02	30.24	19	29.60	1	0.64	72.4	+ 2.4	101.7	11	87.2	48.0	16	59.8	53.7	37.8	10	14.5	8	69.3	60.6	3.11	− 1.30	7,027	se.	40	ne.	28	11	7	16	8
Yankton	1,234	28.60	+.02	29.96	30.24	19	29.68	1	0.56	74.8	+ 1.8	101.8	30	87.4	54.2	19	65.4	47.6	32.2	5	11.9	8	73.4	65.2	1.91	− 1.92	5,070	s.	34	n.	13	6	6	12	13
Kansas City	......	29.05	.....	......	......	..	......	..	....	78.8	......	96.8	20	89.6	63.9	23	70.7	32.9	28.2	29	10.4	9	71.8	68.0	4.53	......	4,955	s.	42	s.	5	7	4	15	12
Wichita	......	28.58	.....	......	......	..	......	..	....	80.0	......	100.5	29	92.7	65.0	19	70.3	35.5	28.0	20	14.5	9	65.1	65.6	1.04	......	5,405	s.	23	s.	25	7	5	9	17
Northern slope.										**68.4**	**+ 0.6**														**1.50**	**− 0.22**									
Fort Assinaboine	2,720	27.19	+.03	29.96	30.32	21	29.53	10	0.79	67.9	− 0.1	102.0	10	83.6	44.0	15	53.6	58.0	41.5	10	18.7	2	51.1	46.0	0.51	− 2.05	7,950	sw.	56	e.	21	6	5	7	19
Fort Custer	3,040	26.88	+.04	29.96	30.26	17	29.61	10	0.65	70.2	− 0.8	102.9	10	85.1	45.0	17	56.8	57.9	45.8	19	14.9	31	50.6	55.5	1.20	− 0.06	5,183	se.	40	nw.	12	6	9	3	19
Fort Maginnis	4,340	25.66	+.04	29.99	30.30	21	29.64	10	0.66	64.6	+ 0.6	94.0	10	76.5	45.0	15	52.4	49.0	38.0	31	14.6	5	50.3	44.2	0.88	− 0.02	5,124	nw.	48	nw.	13	7	4	10	17
Helena	4,069	25.90	+.02	29.97	30.32	21	29.56	10	0.76	67.1	+ 0.1	99.1	10	81.0	46.5	15	55.3	52.6	38.5	9	16.5	25	40.2	43.4	0.89	− 0.20	5,309	sw.	48	sw.	8	10	7	12	12
Poplar River	2,030	27.72	−.10	29.96	30.23	8	29.61	10	0.62	66.9	+ 1.1	97.0	10	82.4	45.0	18	53.9	52.0	48.7	19	16.0	5	64.0	53.2	2.13	+ 0.42	5,105	w.	50	n.	28	9	6	11	14
Cheyenne	6,105	24.15	+.03	29.96	30.31	18	29.64	3	0.67	68.2	+ 2.2	97.2	11	83.6	45.2	18	54.9	52.0	42.2	11	14.2	23	48.5	43.8	2.31	+ 0.59	7,408	nw.	42	nw.	5	17	9	14	8
Fort Laramie	......	......	.....	......	......	..	......	..	....	75.6	......	103.1	11	93.5	49.0	5	57.6	54.1	48.0	5	15.3	16	......	......	2.94	......	......	e.	...	......	..	8	..	..	..
North Platte	2,841	27.12	+.03	29.99	30.26	18	29.62	1	0.64	73.7	+ 0.7	101.2	5	88.4	53.4	18	62.6	47.8	36.5	5	12.2	8	66.4	60.2	2.61	− 0.19	6,539	e.	40	nw.	15	9	5	9	17
Rapid City	3,280	26.67	.....	29.93	30.18	18	29.65	11	0.53	71.0	......	100.0	10	83.0	51.4	16	59.4	48.6	39.0	10	10.0	31	60.4	54.8	1.69	......	6,348	n.	36	sw.	28	11	8	14	9
Fort Washakie	......	24.54	.....	29.79	30.23	18	29.62	11	0.61	67.9	......	99.0	11	85.0	43.0	3	53.4	56.0	47.5	10	13.0	13	47.4	42.4	0.87	......	4,369	sw.	30	sw.	27	5	6	13	12
Fort McKinney	......	25.09	.....	29.96	30.23	18	29.58	12	0.65	68.1	......	95.0	10	79.3	48.0	2	58.2	47.0	30.0	4	8.0	1	60.8	52.8	2.89	......	......	nw.	48	nw.	7	9	13	7	11
Middle slope.										**77.1**	**+ 1.6**														**2.42**	**− 0.82**									
Colorado Springs	......	......	.....	......	......	..	......	..	....	70.5	......	96.4	12	86.9	46.7	19	56.6	49.7	40.2	12	16.5	18	50.4	48.2	1.91	......	......	......	...	......	..	10	1	16	14
Denver	5,281	24.86	+.04	29.94	30.25	18	29.62	12	0.63	71.4	− 0.6	103.0	11	89.3	51.4	16	59.2	51.6	38.9	3	14.7	23	45.2	45.0	0.41	− 1.32	5,002	s.	36	s.	29	11	2	22	7
Pike's Peak	14,134	18.12	.....	......	30.31	21	29.61	12	0.70	42.5	......	61.5	11	50.8	31.5	24	36.2	30.0	23.4	3	5.1	21	83.7	37.6	4.16	− 0.29	9,131	nw.	63	sw.	2	..	..	..	..
Concordia	1,384	28.54	.....	29.96	30.22	19	29.75	3	0.47	79.1	+ 3.1	103.0	30	92.7	58.5	19	68.7	44.5	31.5	20	12.2	24	64.8	64.8	1.85	− 1.43	4,232	se.	23	se.	2	9	3	14	14
Dodge City	2,524	27.43	+.03	30.00	30.28	19	29.73	2	0.55	79.0	+ 2.0	102.0	13	92.4	59.5	18	67.5	42.5	30.5	12	16.8	24	59.8	62.2	4.07	− 0.76	8,985	se.	36	se.	3	9	1	13	17
Fort Reno	......	......	.....	......	......	..	......	..	....	80.6	......	98.7	28	93.1	61.4	11	68.2	37.3	....	..	....	..	......	......	3.21	+ 0.93	......	s.	...	......	..	5	..	..	..
Fort Supply*	......	......	.....	......	......	..	......	..	....	82.4	......	99.6	12	93.3	64.3	17	71.6	35.3	28.2	13	16.6	8	......	......	2.48	− 2.50	......	se.	...	......	..	7	..	..	..
Fort Elliott	2,650	27.30	+.04	29.99	30.22	19	29.69	2	0.53	79.0	+ 2.0	101.4	16	92.7	60.2	18	67.1	41.2	30.8	12	20.3	22	53.2	58.4	2.50	+ 0.16	7,950	se.	60	nw.	17	8	1	13	17
Pueblo	4,724	25.35	.....	29.93	30.26	19	29.51	12	0.75	74.8	......	102.7	12	92.5	51.3	19	61.9	51.4	40.7	12	15.2	18	40.8	47.6	1.33	......	4,894	nw.	36	w.	7	6	7	16	18
Southern slope.										**78.4**	**− 1.3**														**2.00**	**− 0.88**									
Fort Sill	1,200	28.78	+.02	30.01	30.24	20	29.83	16	0.41	79.2	− 2.8	99.0	30	92.1	59.8	24	68.0	39.2	31.7	26	15.2	8	70.8	68.0	3.52	+ 0.68	6,152	s.	26	n.	18	4	2	4	25
Abilene	1,748	28.22	+.03	29.99	30.21	20	29.85	26	0.36	82.5	+ 0.5	96.5	14	92.8	66.1	7	72.3	30.4	25.3	21	15.0	9	60.6	65.4	0.46	− 1.64	6,857	s.	36	sw.	2	3	0	13	18
Fort Davis	4,928	25.26	.00	30.00	30.21	20	29.80	2	0.41	73.5	− 1.5	91.0	14	85.1	60.0	11	64.8	31.0	27.0	4	12.0	23	63.9	53.6	2.43	− 0.94	3,726	sw.	30	sw.	27	18	14	7	10
Fort Stanton	6,154	24.08	.....	29.88	30.16	19	29.63	3	0.53	68.8	......	89.3	4	81.8	51.0	4	55.6	38.3	38.3	4	18.3	22	51.6	47.2	1.60	− 1.64	4,120	s.	30	n.	25	11	7	14	10
Southern plateau.										**77.6**	**− 0.4**														**1.27**	**+ 0.07**									
El Paso	3,796	26.74	.....	29.92	30.15	20	29.70	16	0.45	80.1	− 1.9	101.0	4	95.2	63.2	1	69.0	37.8	32.7	4	20.6	31	47.6	55.5	1.39	− 1.25	5,330	e.	48	n.	4	8	6	9	16
Lava	......	......	.....	......	......	..	......	..	....	81.6	......	107.0	18	98.3	60.7	23	65.0	46.3	40.3	18	25.5	31	......	......	2.12	+ 0.26	......	se.	...	......	..	15	..	..	..
Santa Fé	7,026	23.42	+.01	30.01	30.30	19	29.73	2	0.57	68.8	+ 0.8	96.6	4	82.0	51.0	24	58.3	45.6	31.0	3	19.0	27	45.2	43.5	1.98	− 1.05	4,846	e.	45	w.	18	15	5	10	16
Fort Apache	5,020	.....	.....	......	......	..	......	..	....	77.0	......	100.8	9	92.8	50.0	2	61.3	50.8	45.8	5	17.1	29	......	......	3.24	− 0.49	......	sw.	...	......	..	17	..	..	..
Fort Bowie	......	......	.....	......	......	..	......	..	....	78.7	......	97.5	8	89.3	62.0	31	68.1	35.5	....	..	....	..	......	......	2.50	+ 0.20	......	sw.	...	......	..	13	..	..	..
Fort Grant	4,860	25.23	−.03	29.93	30.12	21	29.72	7	0.40	76.3	− 0.7	97.6	8	90.1	60.5	16	68.2	37.1	30.5	15	10.0	28	29.1	39.2	4.27	+ 0.30	4,120	nw.	42	se.	14	16	12	12	7
Fort McDowell	......	......	.....	......	......	..	......	..	....	90.6	......	117.0	9	107.0	62.0	2	74.2	55.0	45.0	9	17.0	30	......	......	0.86	+ 0.82	......	w.	...	......	..	2	..	..	..
Fort Thomas	2,710	......	.....	......	......	..	......	..	....	87.3	......	113.3	8	103.1	59.8	3	71.6	53.5	44.9	3	21.6	31	......	......	1.88	+ 0.01	......	w.	...	......	..	11	..	..	..
Fort Verde	......	......	.....	......	......	..	......	..	....	83.4	......	109.2	9	101.5	50.5	2	65.3	58.7	51.8	4	16.3	30	......	......	2.21	+ 0.44	......	w.	...	......	..	9	..	..	..
Phœnix	......	......	.....	......	......	..	......	..	....	90.7	......	112.0	10	104.6	68.0	4	76.9	44.0	....	..	....	..	......	......	0.13	− 0.63	......	......	...	......	..	1	..	..	..
Prescott	5,389	24.81	+.02	29.96	30.21	20	29.77	1	0.44	72.4	+ 0.4	96.1	15	89.3	45.7	2	59.1	50.4	41.5	2	10.8	29	57.8	53.6	2.49	+ 0.41	6,180	w.	36	se.	19	11	9	7	15
San Carlos	......	......	.....	......	......	..	......	..	....	87.6	......	114.0	9	104.5	60.0	3	70.8	54.0	46.0	6	21.0	29	......	......	2.10	+ 0.28	......	s.	...	......	..	16	..	..	..
Willcox	......	......	.....	......	......	..	......	..	....	78.5	......	104.5	8	95.6	51.2	4	61.4	53.3	50.9	4	22.8	30	......	......	3.68	+ 1.90	......	w.	...	......	..	16	..	..	..
Yuma	141	29.66	.00	29.80	29.97	20	29.68	8	0.29	90.4	− 0.6	113.7	22	100.5	63.0	1	76.4	50.7	39.9	1	18.0	11	40.7	58.8	0.04	− 0.11	5,361	s.	23	s.	23	1	4	4	23
Keeler	3,622	26.29	.....	29.82	30.11	20	29.65	30	0.46	79.3	......	98.0	15	92.5	54.1	12	67.8	43.9	31.8	2	13.2	17	29.2	41.8	0.17	− 0.05	5,049	e.	42	s.	11	2	4	6	21
Middle plateau.										**74.1**	**+ 0.8**														**0.41**	**− 0.10**									
Fort Bidwell	4,640	25.43	.....	30.00	30.26	14	29.78	24	0.48	66.8	......	91.5	22	83.3	41.1	2	49.4	50.4	41.0	5	19.0	31	47.1	42.0	0.34	− 0.16	4,527	w.	36	w.	11	2	5	7	19
Winnemucca	4,344	25.66	+.05	29.98	30.32	13	29.55	11	0.77	72.2	+ 0.2	96.0	20	88.7	40.5	1	54.4	55.5	46.0	9	22.6	26	20.8	22.4	0.01	− 0.15	7,305	sw.	44	sw.	13	1	5	7	19
Brock's	......	......	.....	......	......	..	......	..	....	74.4	......	103.0	8	91.8	48.0	3	57.1	55.0	47.9	3	12.8	31	......	......	2.40	......	......	w.	...	......	..	12	..	..	..
Salt Lake City	4,348	25.64	+.01	29.87	30.19	13	29.67	26	0.52	76.5	+ 1.5	97.9	9	90.0	51.7	16	63.3	46.2	36.3	3	17.2	31	37.8	46.0	0.24	− 0.35	4,123	sw.	32	s.	24	4	3	17	11
Montrose	5,780	24.38	.....	29.90	30.25	21	29.60	11	0.65	71.7	......	97.0	5	88.2	45.9	2	57.3	51.1	42.4	4	17.8	1	41.6	43.4	0.51	− 0.41	4,481	se.	36	se.	5	7	11	9	11
Fort Bridger	6,643	23.64	.....	30.00	30.28	18	29.72	11	0.56	64.5	......	89.0	10	80.3	38.0	18	48.7	51.0	43.0	18	11.8	31	49.8	41.5	0.94	+ 0.58	3,469	w.	34	s.	6	9	10	14	7
Carson City	......	......	.....	......	......	..	......	..	....	66.5	......	94.4	16	84.7	38.0	1	51.5	56.4	44.1	16	16.1	31	36.4	35.1	0.13	......	......	......	...	......	..	3	2	8	21
Northern plateau.										**71.0**	**0.0**														**0.55**	**+ 0.18**									
Boisé City	2,750	27.14	+.01	29.91	30.33	13	29.83	9	0.50	72.6	− 0.4	102.4	9	91.6	43.4	13	55.0	59.0	45.9	10	2.09	23	40.4	42.2	0.48	+ 0.28	1,643	w.	26	e.	31	4	7	4	20
Fort Klamath	......	......	.....	......	......	..	......	..	....	59.3	......	90.0	21	77.8	31.0	26	40.8	59.0	45.0	30	13.0	12	......	......	c.92	+ 0.37	......	w.	...	......	..	3	..	..	..
Lakeview	......	......	.....	......	......	..	......	..	....	......	......	......	..	......	......	..	......	....	....	..	....	..	......	......	0.84	+ 0.52	......	s.	...	......	..	3	..	..	..
Spokane Falls	1,909	27.97	+.01	29.96	30.32	15	29.68	31	0.64	67.6	− 1.4	96.1	22	84.6	42.2	16	51.7	53.9	42.7	8	17.1	1	55.6	47.6	0.06	− 0.85	3,923	sw.	24	sw.	3	3	8	2	21
Walla Walla	1,018	28.92	+.02	29.98	30.34	15	29.70	8	0.64	72.8	+ 1.8	102.4	18	87.7	48.4	5	59.2	54.0	39.7	7	15.9	1	36.0	39.2	0.46	+ 0.44	5,040	sw.	26	sw.	12	3	4	3	24
N. Pac. coast region.										**61.2**	**+ 1.2**														**2.09**	**+ 0.57**									
Neah Bay	......	......	.....	......	......	..	......	..	....	56.2	......	71.5	23	64.9	39.0	5	47.4	32.5	....	..	....	..	......	......	4.96	+ 2.99	......	sw.	...	......	..	8	..	..	..
Olympia	36	30.02	.00	30.06	30.38	15	29.84	31	0.54	61.2	− 0.8	92.0	17	75.4	40.5	7	49.2	51.5	41.5	17	10.0	2	72.0	50.2	1.36	+ 0.49	2,764	s.	14	s.	1	6	11	7	13
Port Angeles	14	30.04	+.03	30.05	30.37	15	29.77	3	0.60	55.8	+ 0.8	77.2	18	65.9	41.0	6	47.9	36.2	28.0	30	8.2	9	81.5	49.6	1.11	+ 0.72	4,124	s.	25	w.	4	9	7	10	14
Pysht	......	......	.....	......	......	..	......	..	....	58.0	......	75.0	16	65.8	40.0	7	50.3	35.0	31.0	16	5.0	27	......	......	2.54	+ 1.60	......	w.	...	......	..	9	..	..	..
Tatoosh Island	86	29.98	+.04	30.07	30.39	15	29.76	3	0.63	56.0	+ 1.0	68.9	17	61.2	49.0	28	52.3	19.9	15.5	17	5.2	2	87.1	52.0	3.44	+ 1.02	6,933	sw.	44	e.	17	11	10	8	13
Astoria	20	30.03	.....	30.05	30.35	15	29.79	31	0.56	62.2	+ 6.2	88.0	17	70.5	48.0	11	51.6	40.0	26.0	10	7.0	24	73.8	53.2	1.25	+ 0.09	5,111	sw.	22	nw.	6	7	9	5	17
Portland	80	29.97	+.02	30.05	30.35	15	29.80	30	0.55	66.2	+ 0.2	97.0	17	80.3	46.0	6	54.8	51.0	39.2	21	12.5	4	65.2	52.8	1.04	− 2.83	4,443	nw.	20	nw.	6	5	10	4	17
Roseburg	523	29.49	−.01	30.04	30.32	14	29.74	30	0.58	66.0	0.0	100.0	17	81.3	44.7	27	53.0	55.3	42.2	17	12.8	3	65.4	51.8	1.05	+ 0.49	3,133	n.	20	n.	4	2	5	7	19
Mid. Pac. coast reg.										**70.8**	**− 0.7**														**0.03**	**+ 0.02**									
Eureka	50	30.00	.....	30.06	30.27	13	29.86	16	0.41	56.5	......	73.0	16	62.6	48.4	10	53.3	24.6	21.3	16	5.5	29	88.0	52.8	0.44	......	5,265	n.	36	nw.	14	2	9	8	14
Red Bluff	342	29.55	+.03	29.89	30.19	12	29.73	23	0.46	80.9	− 1.1	109.0	21	96.7	53.9	9	65.7	55.1	36.5	31	23.6	12	96.7	65.7	0.07	+ 0.06	4,909	s.	29	s.	11	2	0	4	27
Sacramento	64	29.83	+.01	29.90	30.21	12	29.75	16	0.46	71.6	− 0.4	104.0	16	89.5	51.0	29	57.3	53.0	39.0	29	19.0	11	67.2	52.6	T.	0.00	5,905	s.	24	sw.	11	0	0	2	29
San Francisco	60	29.92	+.02	29.98	30.21	12	29.81	15	0.40	59.1	+ 0.1	93.4	15	68.4	51.0	26	54.4	42.4	35.9	15	9.0	24	78.7	51.9	0.01	− 0.01	8,664	sw.	35	w.	22	1	4	18	9
S. Pac. coast region.										**68.2**	**+ 1.2**														**0.00**	**0.00**									
Fresno	313	29.56	.....	29.88	30.20	12	29.73	16	0.47	80.6	......	109.2	16	99.5	53.5	12	63.9	55.7	42.3	6	21.4	11	55.0	54.1	T.	......	4,425	nw.	20	nw.	31	0	2	2	27
Los Angeles	339	29.58	.00	29.94	30.09	12	29.83	14	0.26	67.9	+ 1.1	95.0	21	87.4	49.0	12	59.3	46.0	40.0	13	20.5	10	75.6	59.2	0.04	+ 0.01	4,136	w.	21	w.	20	1	1	13	17
San Diego	67	29.88	.00	29.95	30.10	12	29.86	14	0.24	68.4	+ 1.4	77.2	21	74.4	54.6	13	62.5	22.6	20.4	13	7.3	7	81.6	62.1	0.01	− 0.01	4,198	nw.	18	w.	4	1	4	4	23

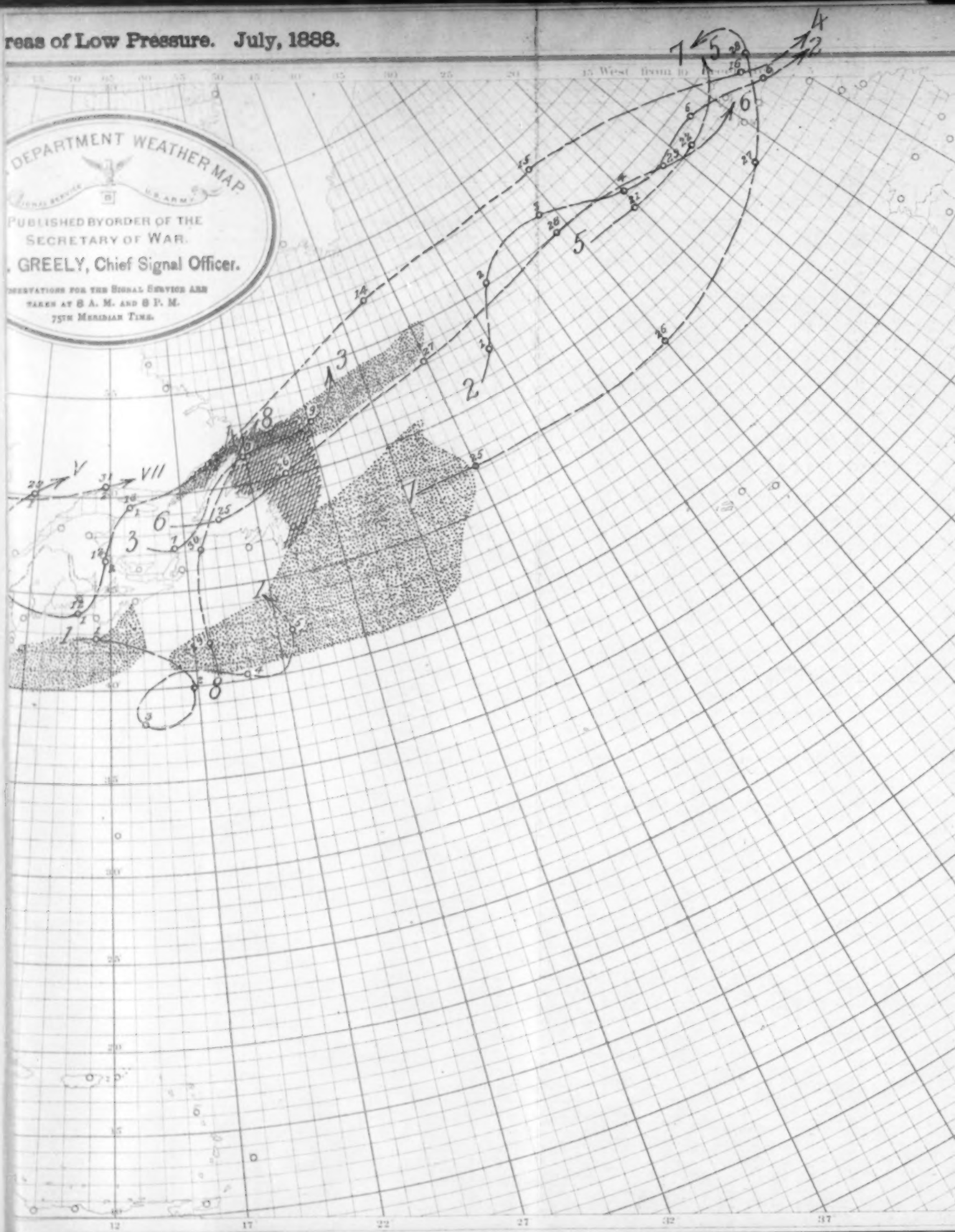
NOTE.—The data at Mount Washington, N. H., Pike's Peak, Colo., and stations having no departures are not used in computing the district averages. * Record for 30 days.

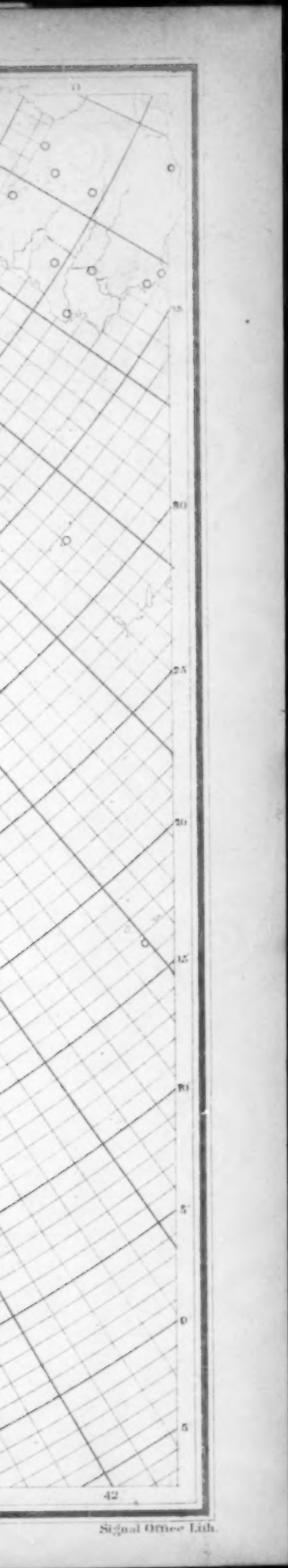
Form 196. C 1884

Chart I. Tracks of Areas of Low



reas of Low Pressure. July, 1888.





Signal Office Lith.

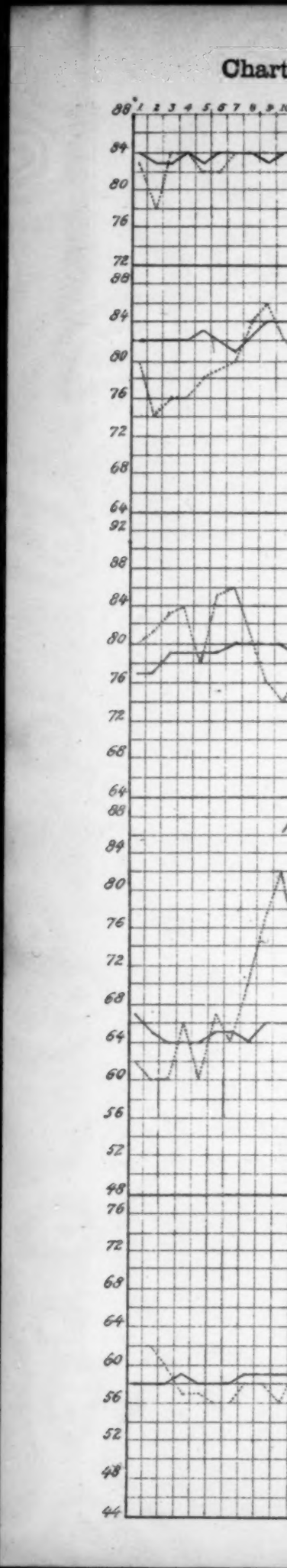


Chart
88
84
80
76
72
88
84
80
76
72
68
64
92
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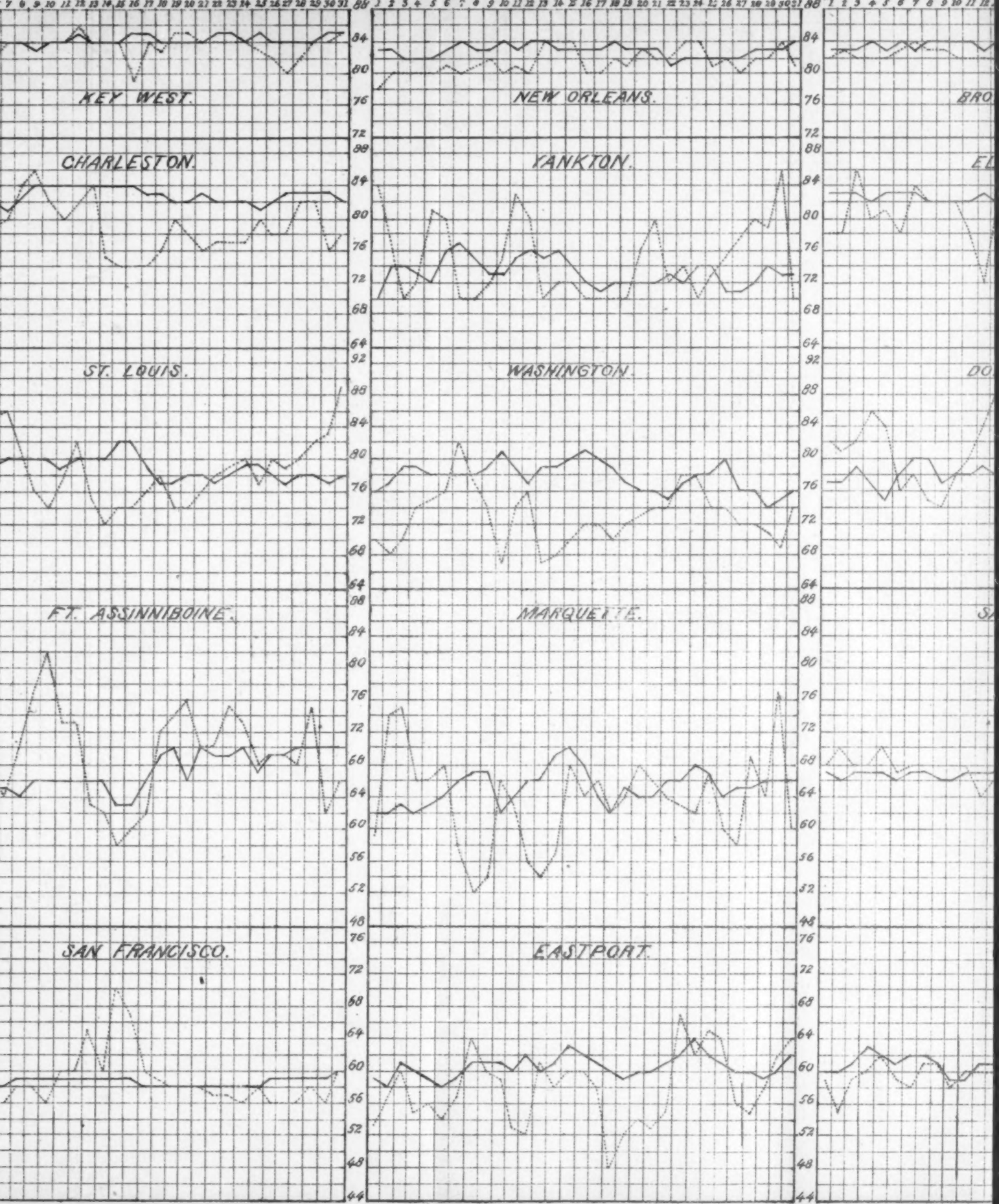
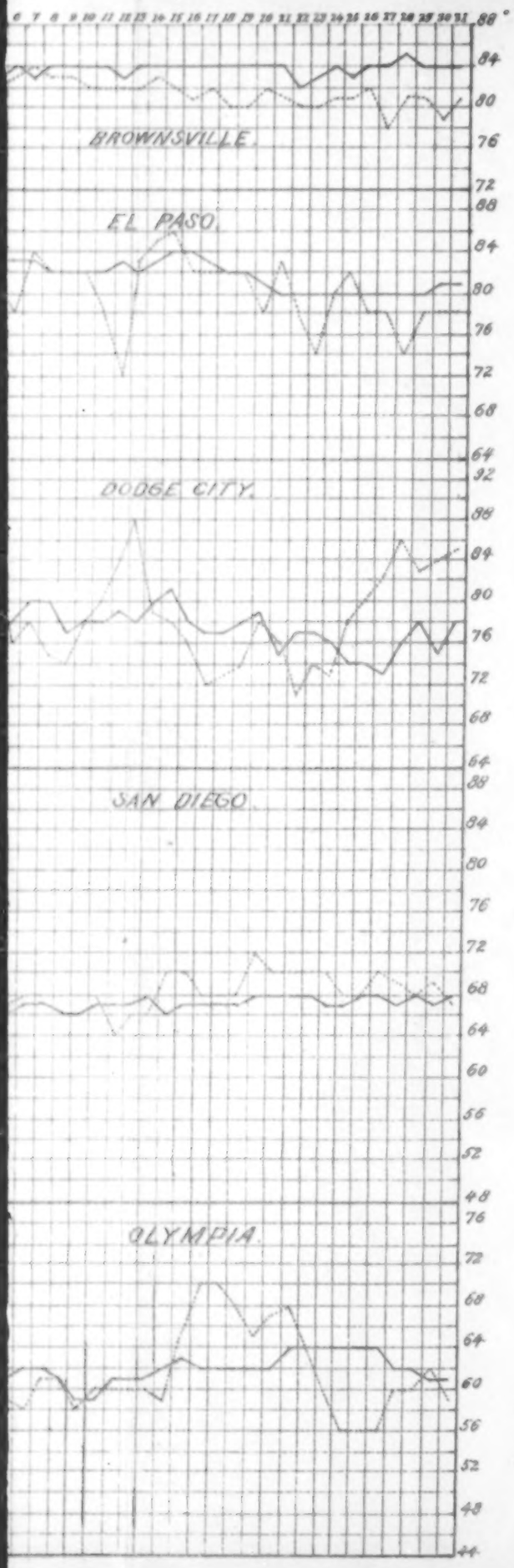
84
80
76
72
68
64
88
84
80
76
72
68
64
60
56
52
48
76
72
68
64
60
56
52
48
44

Chart III. Normal July temperatures for a number of years (———). Mean temperatures for July,

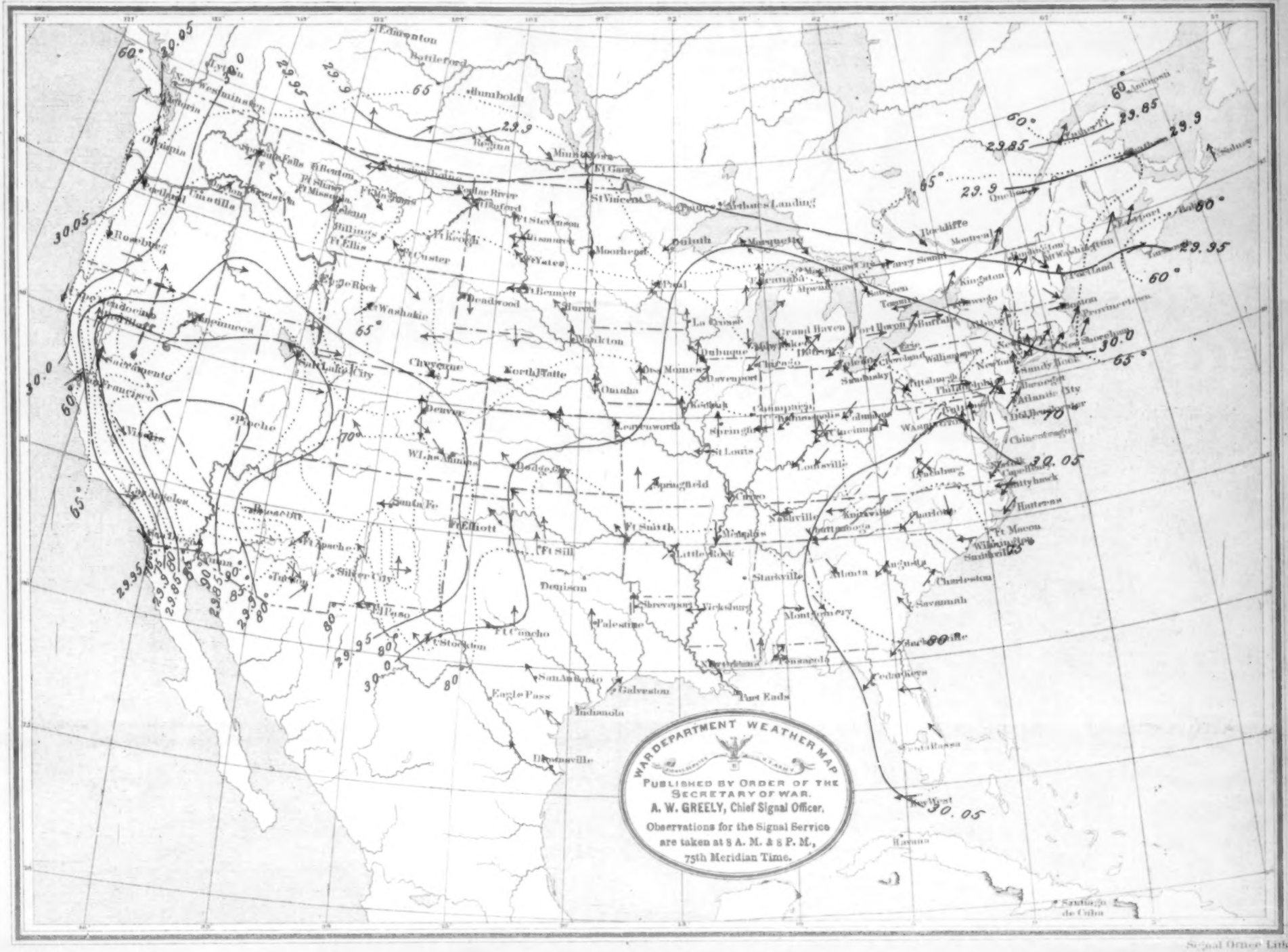


s for July, 1888 (------).



Form 106 F.

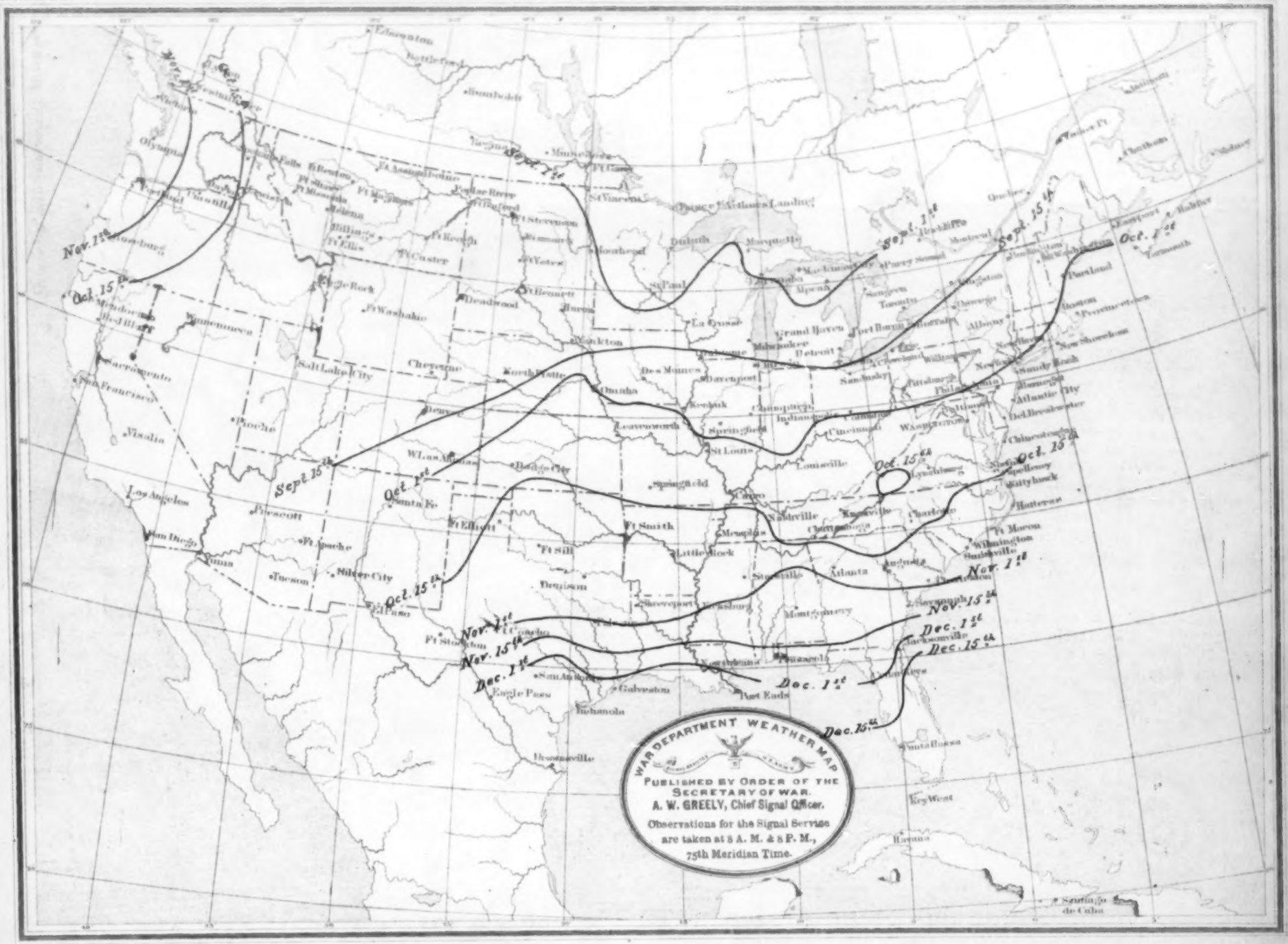
Chart II. Isobars, Isotherms, and Winds. July, 1888.



Signal Office Lith.

Form 1065 F

Chart VI. Average date of First Killing Frost, based upon data furnished by Voluntary Observers of the Signal Service.



Form 106 F

Chart V. 18 years Normal Precipitation for July.

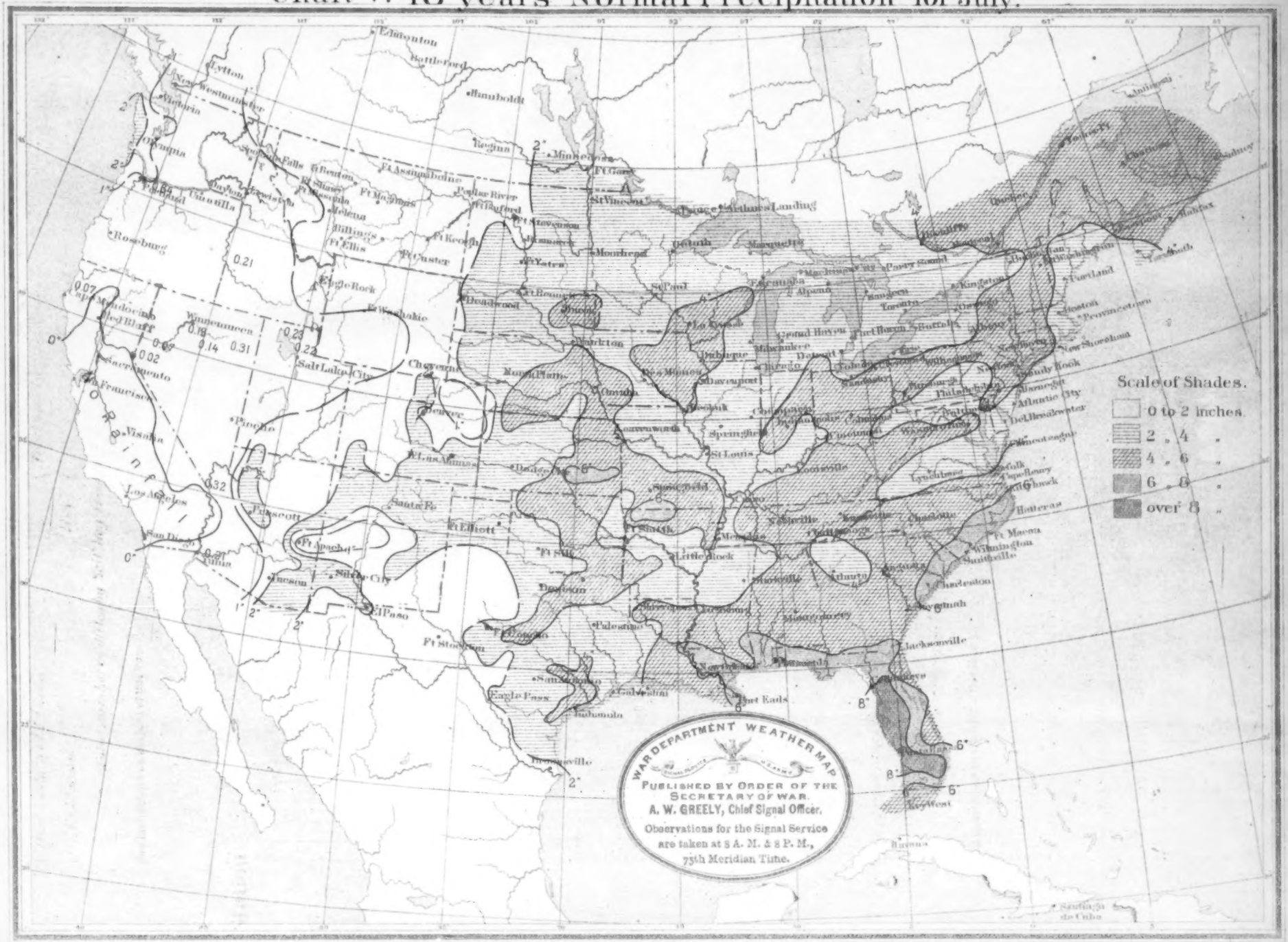
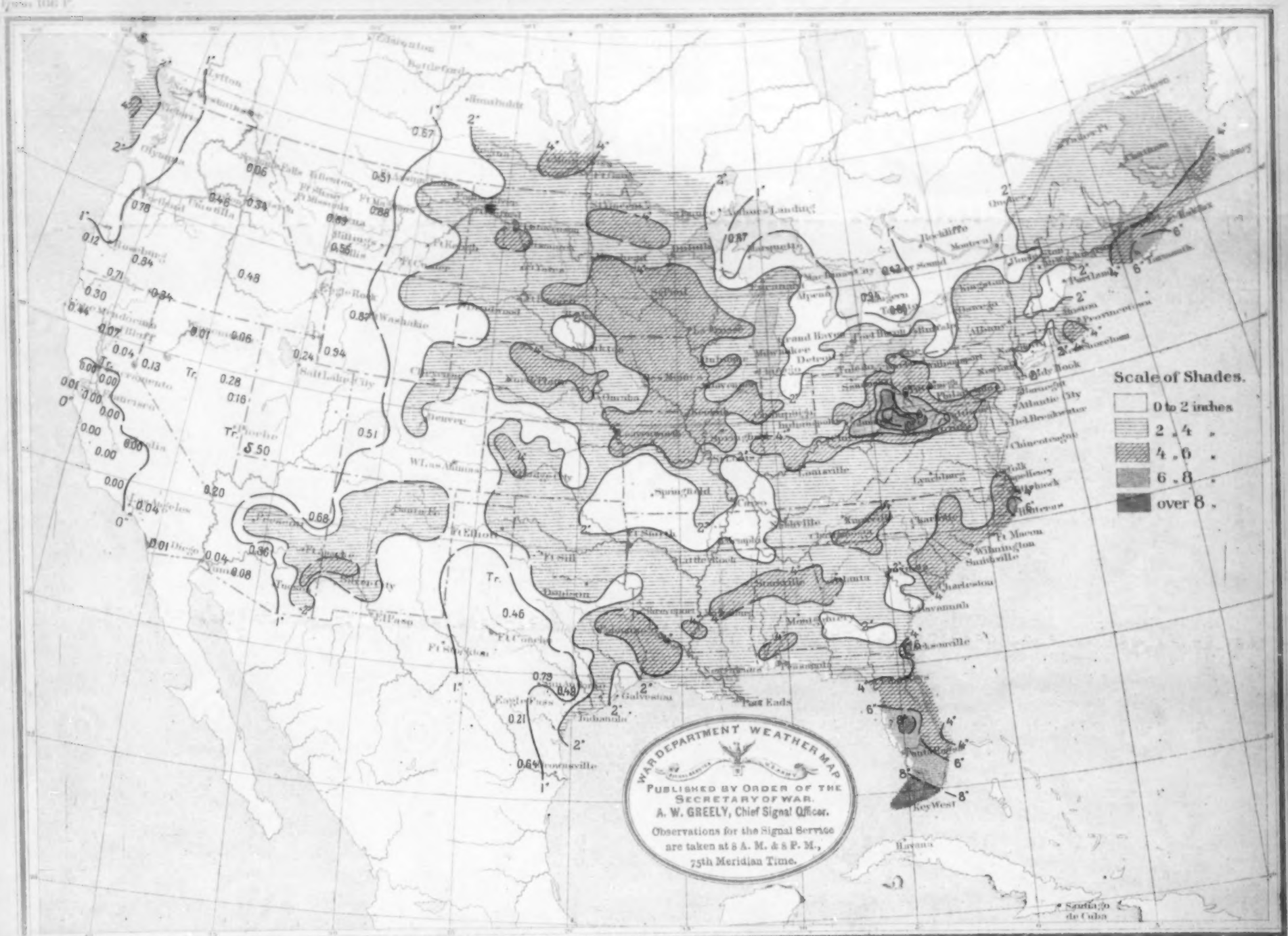


Chart IV. Precipitation, July, 1888.



Signal Office Lith

List of voluntary stations of the Signal Service, with their respective observers, who furnish meteorological reports for the Monthly Weather Review. Those marked with an asterisk (*) did not send reports in time to be used in Review for July, 1888.

Place of observation and observer.
ALABAMA.
Auburn, Alabama Weather Service.
Citronville, J. G. Mitchael.
Livingston, J. W. A. Wright.
New Market, Dr. Geo. D. Norris.
ARIZONA.
Antelope Valley, Mrs. J. H. Hamilton.
Bangharts,
Cedar Springs, J. E. Norton.
*Eagle Pass, R. B. Tripp.
Flagstaff, Braunen & Co.
Globe, J. H. Hamill.
Holbrook, David Rohe.
Huachuca, J. W. Stump.
Prescott Junction, W. W. Burmeh.
Showlow, C. E. Cooley.
Tevis, Miss Belle Tevis.
Tucson, Edward L. Wetmore.
Williams, J. T. Ryan.
Willow Springs, F. A. Chamberlin.
Winslow, L. W. Broberts.
ARKANSAS.
*Eureka Springs, A. H. Foote.
Lead Hill, Silas C. Turnbo.
Little Rock, Arkansas Weather Service.
CALIFORNIA.
Anderson, Dr. A. Fouch.
Banning, Welwood Murray.
Barstow, Geo. R. Gooding.
Georgetown, C. M. Fitzgerald.
Hydesville, E. T. Foss.
Lewis Creek, John Touhy.
Needles, John J. Clark.
*Nicolaus, Alvah Pendleton.
Oakland, Dr. J. B. Trembley.
Oroville, Hiram Arents.
*Riverside, A. K. Holt.
Salinas, Dr. E. K. Abbott.
Sacramento, S. H. Gerrish.
Santa Barbara, H. D. Vail.
Santa Maria, L. E. Blochman.
Willows, David Bentley.
COLORADO.
Bennett, I. S. Putnam.
Colorado Springs, Colorado Weather Service.
*Fort Collins, Prof. V. E. Stolbrand.
Georgetown, W. A. Jayne, M. D.
CONNECTICUT.
Hartford, Wm. R. Matson.
New Hartford, Wm. Goodwin.
Southington, Luman Andrews.
Voluntown, Rev. E. Dewhurst.
DAKOTA.
Brookings, Prof. Louis McLeod.
Davenport, J. W. Leech.
Gallatin, J. S. Pound.
Garden City, W. C. T. Newell.
Goddard, Mrs. M. F. Goddard.
Highmore, W. R. McDowell.
Kimball, A. S. Stuver.
Long Creek, Elizabeth Ingalls.
New England City, Lewis A. Dodge.
*Parkston, John J. Swartz.
Richardton, Prof. A. Nordberg.
Webster, Arthur Betts.
Woonsocket, L. O. Libbey.
DISTRICT OF COLUMBIA.
*Kendall Green, Deaf & Dumb Institute.
Receiving Reservoir, Distributing Reservoir, Rock Creek Bridge } Washington Aqueduct.
FLORIDA.
*Altamonte Springs, E. P. Tebeau.
Archer, Dr. J. C. Neal.
Fort Meade, A. H. Adams.
Homeland, J. S. Wade.
*Limona, J. G. Knapp.
Manatee, Mrs. Mary W. Broberg.
Merritt's Island, Rev. J. H. White.
Nama, Chas. E. Robbins.
Tallahassee, Rev. Dr. W. H., Carter.
GEORGIA.
Andersonville, H. W. Bryant.
Athens, Prof. L. H. Charbonnier.
Buck, A. L. Gillespie.
Forsyth, Thos. G. Scott.
Marietta, G. S. Owen.
Milledgeville, S. A. Cook.
*Thomasville, C. S. Bondurant.
IDAHO.
Lewiston, Robert Schleicher.
ILLINOIS.
Charleston, J. B. Dazey.
Collinsville, Dr. J. L. R. Wadsworth.

Place of observation and observer.
ILLINOIS—Continued.
Jacksonville, P. J. Hasenstab.
Mount Morris, Wm. Feary.
Oswego, John S. Seely.
Palestine, John E. Templeton.
Pekin, Rev. J. E. Terborg.
Philo, H. A. Burr.
Riley, John W. James.
Rockford, T. D. Robertson.
Sycamore, Roswell Dow.
Sandwich, Dr. N. E. Baliou.
South Evanston, Dr. M. D. Ewell.
Springfield, Illinois Weather Service.
*Windsor, A. H. Hatch.
INDIANA.
Butlerville, C. F. Hole.
Connersville, Robt. Hessler.
Jeffersonville, J. C. Loomis.
Laconia, Lafe Crozier.
La Fayette, Indiana Weather Service.
*La Grange, R. H. Rerrick.
Logansport, Thos. B. Helm.
Mauzy, Elwood Kirkwood.
Salem, J. W. May.
Scalesville, Urias Wilson.
Sunman, B. F. Ferris.
Vevay, Prof. Chas. Boerner.
INDIAN TERRITORY.
Caddo Creek, P. Leming, M. D.
IOWA.
*Albion, Enoch Lewis.
Amana, Conrad Schadt.
Ames, J. Rush Lincoln.
*Auburn, Edwin Miller.
*Bancroft, H. N. Renfrew.
Cedar Rapids, H. D. Olds.
Clarinda, A. S. Van Sandt.
*Clear Lake, Dr. J. C. Wright.
Clinton, Luke Roberts.
Cresco, Gregory Marshall.
Cromwell, E. E. Harrison.
Denmark, G. B. Brackett.
Des Moines, Adolphus Voegeli.
Dysart, Jos. Dysart.
Elkader, J. N. Hamilton.
*Fairfield, Geo. D. Clark.
Fayette, Upper Iowa University.
Fort Madison, Miss L. A. McCready.
Glenwood, Seth Dean.
Glenwood, A. Schappel.
Grinnell, Prof. S. J. Buck.
Hampton, E. C. Grenelle.
Humboldt, Miss. Florence Prouty.
Independence, Emil F. Wülfke.
Iowa City, Prof. A. A. Veblen.
Logan, Jacob T. Stern.
Manson, W. L. Thompson.
Maquoketa, A. B. Bowers.
Monticello, H. D. Smith.
Mount Pleasant, Prof. Max E. Witte.
Mount Vernon, Prof. Alonzo Collin.
Muscatine, J. P. Walton.
Osage, G. D. Pettingill.
Osceola, F. M. Kyte.
Oskaloosa, Joseph Boyd
Oskaloosa, O. H. Avey.
Sac City, Dr. Caleb Brown.
Smithland, Dr. Chas. Rice.
Vinton, T. F. McCune.
Washington, Wm. A. Cook.
*Webster City, Elon Lee.
Wesley, Wm. Ward.
KANSAS.
Allison, John J. Cass.
*East Norway, P. L. Gray.
Elk Falls, Dr. A. C. Williams.
*Emporia, Prof. J. H. Dinsmore, jr.
Englewood, C. D. Perry.
Globe, Wm. Featherston.
Havensville, L. W. Dennen.
Independence, J. M. Altaffer.
Lawrence, Prof. F. H. Snow.
Lebo, C. W. Burnet.
Leoti, L. C. Vickrey.
Manhattan, C. P. Blachley.
Morse, R. P. Edgington.
Ninnescah, E. Shaw.
Salina, J. H. Gibson.
Topeka, Kansas Weather Service.
Tribune, S. B. Jackson.
*Wakefield, Wm. P. Cochran
Wellington, John H. Wolfe.
*Wilson, E. Y. Dollenmayer.
Yates Centre, F. R. Gray.

Place of observation and observer.
KENTUCKY.
Bowling Green, M. H. Crump.
Carlisle, W. H. Fritts.
*Elkin, Chas. Ogden.
Frankfort, E. C. Went.
Millersburg, C. Pope.
LOUISIANA.
*Grand Coteau, Rev. C. M. Widman.
Liberty Hill, E. A. Crawford.
Luling, F. M. Rogers.
New Orleans, Louisiana Weather Service.
*Port Eads, Mrs. C. L. Kleinpeter.
MAINE.
Bar Harbor, Joseph Wood.
Cornish, Silas West.
Gardiner, Henry Richards.
Kent's Hill, W. C. Strong.
Orono, Prof. M. C. Fernald.
MARYLAND.
Barren Creek Sp'gs, Albert E. Acworth
Cumberland, E. T. Shriver.
Fallston, Prof. G. G. Curtis.
Gaithersburg, John T. De Sellum.
Great Falls, Washington Aqueduct.
McDonogh, McDonogh Institute.
*M't St. Mary's, M't St. Mary's College.
Woodstock, Woodstock College.
MASSACHUSETTS.
Amherst, Miss S. C. Snell.
Amherst, Massachusetts Agricultural Experimental Station.
Blue Hill, Rev. A. K. Teele.
Blue Hill Observatory, A. L. Rotch.
Cambridge, Harvard College Obs'y.
Dudley, Conant Observatory.
Deerfield, Rev. A. Hazen.
Fall River, C. V. S. Remington.
Heath, B. B. Cutler.
Marion, J. E. Hadley.
Nahant, Wm. D. Hodges.
Newburyport, T. V. Pike.
New Bedford, Thomas R. Rodman.
Provincetown, John R. Smith.
Somerset, Elisha Slade.
Taunton, E. U. Jones, M. D.
Westborough, G. S. Newcomb.
Williamstown, Williams College Obs'y.
Worcester, J. B. Hall.
MICHIGAN.
Benton Harbor, A. J. McCave.
Birmingham, S. Alexander.
Harrisville, Dr. D. W. Mitchell.
Hudson, Major A. H. Boies.
Kalamazoo, W. A. Black.
Lansing, Dr. H. B. Baker.
Lansing, Michigan Weather Service.
Marshall, W. T. Drake.
Mottville, J. A. Hartzler.
Thornville, John S. Caulkins.
Traverse City, S. E. Wait.
MINNESOTA.
Argyle, J. J. Stone.
Le Sueur, L. B. Davis.
Minneapolis, Wm. Cheney.
Northfield, Minnesota Weather Service.
MISSISSIPPI.
Biloxi, Dr. R. G. Hinsdale.
Jackson, W. J. Brown, Jr.
Palo Alto, W. H. Hill.
University, Mississippi Weather Service.
MISSOURI.
Conception, Rev. M. Eckstein.
Fayette, Prof. T. Berry Smith.
Frankford, W. W. Vermillion.
*Pierce City, J. J. Spilman.
Princeton, Wm. Hirons.
St. Louis, Missouri Weather Service.
*Warrenton, Prof. J. H. Frick.
MONTANA.
Virginia City, Eugene Stark.
NEBRASKA.
Crete, Nebraska Weather Service.
Culbertson, G. D. Carrington.
De Soto, Chas. Seitz.
Fairbury, Dr. J. Humphrey.
Falls City, A. B. Newkirk.
Fremont, Rev. L. F. Berry.
Genoa, Geo. S. Truman.
Hay Springs, Wm. Waterman.
Kimball, Wm. G. Barton.
Lincoln, University of Nebraska.
Marquette, John Ellis.
Syracuse, P. W. Risser.
Tecumseh, W. L. Dunlap.

Place of observation and observer.
NEVADA.
Carson City, Chas. W. Friend.
Carson City, Nevada Weather Service.
NEW HAMPSHIRE.
Antrim, Frank W. Palmer.
Berlin Mills, O. A. Bridges.
Concord, W. L. Foster.
Nashua, Chas. H. Webster.
Ashland, Belmont, Bristol, Lake Village, Weir's Bridge, Wolfeborough, } Lake Winnipiseogee Cottou and Woolen Manufacturing Co.
NEW JERSEY.
Beverly, C. F. Richardson.
Clayton, W. T. Wilson.
Egg Harbor City, H. Y. Postma.
Moorestown, Thos. J. Beans.
New Brunswick, New Jersey Weather Service.
Readington, John Fleming.
South Orange, Dr. W. J. Chandler.
Vineland, Dr. O. H. Adams.
NEW MEXICO.
*Albuquerque, S. M. Rowe.
Colidge, H. M. Moran.
Gallinas Spring, J. E. Whitmore.
Las Vegas, F. W. Chatfield.
NEW YORK.
Ardenia, Richard B. Arden.
Auburn, Geo. Casey.
Boyd's Corners, Thomas Manning.
*Brooklyn, Prof. W. C. Peckham.
Cooperstown, G. Pomeroy Keese.
Eden, W. P. Hunt.
Factoryville, T. P. Yates.
*Friendship, Jesse D. Rogers.
Geneva, Mrs. C. K. M. Yates.
Humphrey, Chas. E. Whitney.
Ithaca, Cornell University.
*Le Roy, Prof. F. M. Comstock.
Lyon, Dr. M. A. Veeder.
New York, Central Park Observatory.
*North Volney, J. M. Patrick.
Palmyra, L. D. Cummings.
Penn Yan, Geo. R. Young.
Rose, George Smart.
Savona, M. S. Collier, M. D.
Setauket, Selah B. Strong.
*Syracuse, John F. Boynton.
Utica, Thomas Birt.
Vermillion, E. B. Bartlett.
White Plains, Prof. O. R. Willis.
NORTH CAROLINA.
*Chapel Hill, Prof. J. W. Gore.
Copal Grove, M. Ritchie.
*Hot Springs, Dr. C. F. McGahan.
Lenoir, Dr. R. L. Beall.
Marion, A. Blanton.
*Raleigh, Thos. C. Harris.
Raleigh, N. Carolina Weather Service.
Statesville, W. A. Eliason.
Tarborough, E. V. Zreller.
Weldon, T. A. Clark.
OHIO.
Bellevue, Wm. Sheffield.
Cleveland, G. A. Hyde.
College Hill, John W. Hammitt.
Collinwood, P. L. Cobb.
Columbus, Ohio Weather Service.
Elyria, C. W. Goodspeed.
Garrettsville, S. M. Luther.
Jacksonborough, Dr. J. B. Owsley.
Lordstown, W. S. Dean.
Napoleon, Dr. T. C. Hunter.
New Athens, T. M. Sewell.
North Lewisburg, H. D. Gowey.
Portsmouth, Dr. D. B. Cotton.
Ruggles, Peter Bowman.
Tiffin, Rev. T. H. Sonedecker.
Wauseon, Thos. Mikesell.
Westerville, Prof. John Haywood.
West Milton, Luke S. Motte.
Yellow Springs, Chas. W. Rice.
OREGON.
Albany, John Briggs.
Bandon, Geo. Bennett.
East Portland, Dr. Geo. Wigg.
Eola, Thos. Pearce.
La Grande, J. K. Romig.
McMinnville, Prof. W. J. Crawford.
Mount Angel, Rev. F. Barnabas Held.
Roseburg, Oregon Weather Service.
Yaquina L. H., Dr. John G. Jessup.

List of voluntary stations of the Signal Service, with their respective observers, who furnish meteorological reports for the Monthly Weather Review—Cont'd.

Place of observation and observer.
PENNSYLVANIA.
Altoona, Chas. B. Dudley, M. D.
Catawissa, Robt. M. Graham.
Corry, Wm. Loveland.
Drifton, H. D. Miller.
Dyberry, Theo. Day.
*East Brook, L. E. Stunkard.
Easton, Dr. J. W. Moore.
Franklin, Joseph Bell.
Germantown, Thos. Meehan.
Grampian Hills, Nathan Moore.
Indiana, McL. W. Davis.
Johnstown, E. C. Lorentz.
Meadville, David Logan.
Philadelphia, Pennsylvania Weather Service.
Phillipsburg, L. Ray Morgan.
Quakertown, J. L. Heacock.
Reading, C. M. Dechant.
Salem Corners, T. B. Orchard, M. D.
State College, Agricultural Experimental Station, State College.
Troy, M. Gustin.
Wellsborough, Hiram D. Deming.
West Chester, Dr. Jesse C. Green.
Westtown, Wm. F. Wickersham.
SOUTH CAROLINA.
*Aiken, Dr. W. H. Geddings.
*Black's, Jos. Black.

Place of observation and observer.
Cedar Springs, J. T. Bayerly.
Columbia, South Carolina Weather Service.
*Graham's Turnout, R. H. Sonntag.
Kirkwood, Colin Macrae.
Stateburg, Dr. W. W. Anderson.
TENNESSEE.
Ashwood, Rev. C. F., Williams.
Austin, P. B. Calhoun.
Milan, Dr. M. D. L. Jordan.
Nashville, State Board of Health.
TEXAS.
Austin, Oscar Samostz.
Cedar Hill, J. P. Berry.
Cleburne, Dr. T. C. Osborn.
Colorado, Fred R. Blount.
Comanche, E. N. Wiesendanger.
Corsicana, W. H. Hamilton.
Decatur, H. D. Donald.
Gallinas, Lum Woodruff.
Galveston, Texas Weather Service.
Lampasas, Dr. C. M. Ramsdell.
Mesquite, Silas G. Lackey.
Mexia, Chas. F. Mercer.
*Midland, J. C. Rathburn.
New Ulm, C. Runge.
*Pine Mills, W. E. Burkett.
Silver Falls, C. M. Tilford.
*Santa Maria, L. E. Blochman.

Place of observation and observer.
VERMONT.
*Brattleborough, W. H. Childs.
Burlington, W. B. Gates.
Lunenburg, Dr. Hiram A. Cutting.
Manchester, Rev. E. P. Wild.
Middleburg, S. Holton.
Saint Johnsbury, F. Fairbanks.
Strafford, H. F. J. Scribner.
VIRGINIA.
Bird's Nest, C. R. Moore.
Christianburg, H. D. Walters.
Dale Enterprise, J. L. Heatwoll.
Marion, A. T. Lincoln.
Petersburg, Jas. M. Colson, Jr.
Rappahannock, W. H. Ireland.
Summit, J. R. Sim.
University of Va., James Wearmouth.
Variety Mills, J. H. Micklem.
Wytheville, Howard Shriver.
WASHINGTON TERRITORY.
Blakeley, R. M. Hoskinson.
Tacoma, E. N. Fuller.
Vashon, Mrs. C. B. Carpenter.
WEST VIRGINIA.
Clarksburg, R. T. Lowndes.
Hartmonsville, W. C. Tobb.
Helvetia, Dr. C. T. Stucky.
Middlebrook, S. F. H. Hewit.
Parkersburg, T. G. Field.

Place of observation and observer.
WEST VIRGINIA—Continued.
White Sulpher Springs, T. Surber.
WISCONSIN.
Beloit, Beloit College Observatory.
Delavan, George L. Collie.
Deuster, G. H. Kruschke.
Embarras, J. E. Breed.
Fond du Lac, J. C. Wedge.
Fredonia, B. H. Meyer.
Lancaster, Edward Pollock.
Madison, Washburn Observatory.
Manitowoc, Miss Clasina Lüps.
*Prairie du Chien, College Sacred Heart.
Waucousta, G. H. Yapp.
FOREIGN.
*Burnside, S. A., Dr. C. J. Hering.
Grand Turk, W. Indies, Geo. I. Gibbs.
Guanajuato, Mexico, Met'l Obs'y.
*Hamilton, Bermuda, Russell Hastings.
Killisnoo, Alaska, Jos. Zuhoff.
Leon, Mexico, Prof. M. Leal.
Mazatlan, Mexico, Leon P. Acosta.
Mexico, Mexico, Meteorological Obs'y.
Monterey, Mexico, Dr. Wm. De Ryee.
*Montreal, Quebec, C. H. McLeod.
*New Westminster, B.C., Capt. A. Peele.
*Port au Prince, Hayti, Prof. I. Scherer.
Pueblo, Mexico, Mariano Barcena.
Zacatecas, Mexico, Jose A. y Borrilla.

Military posts from which meteorological reports were received, through the Surgeon General of the Army, in time to be used in the preparation of the Monthly Weather Review for June, 1888.

Alabama.	*California*—Cont'd.	*Dakota*—Cont'd.	*Kansas.*	*Montana*—Cont'd.	*New York.*	*Virginia.*
Mount Vernon B'ks.	Bidwell, Fort.	Sully, Fort.	Hays, Fort.	Shaw, Fort.	Columbus, Fort.	Monroe, Fort.
Arizona.	Gaston, Fort.	Totten, Fort.	Leavenworth, Fort.	*Nebraska.*	Madison Barracks.	*Washington Ter.*
Huachuca, Fort.	Mason, Fort.	Yates, Fort.	Riley, Fort.	Niobrara, Fort.	Niagara, Fort.	Spokane, Fort.
McDowell, Fort.	Presidio of San F.	*Florida.*	*Maryland.*	Robinson, Fort.	Plattsburg Barracks.	Townsend, Fort.
Mojave, Fort.	*Colorado.*	Saint Francis B'ks.	McHenry, Fort.	Sidney, Fort.	West Point.	Walla Walla, Fort.
Arkansas.	Lewis, Fort.	*Idaho.*	*Michigan.*	*Nevada.*	*Oregon.*	*Wyoming.*
Hot Springs.	*Dakota.*	Boisé Barracks.	Brady, Fort.	McDermit, Fort.	Klamath, Fort.	Laramie, Fort.
California.	A. Lincoln, Fort.	Sherman, Fort.	*Minnesota.*	*New Mexico.*	*Texas.*	McKinney, Fort.
Angel Island.	Meade, Fort.	*Indian Territory.*	Snelling, Fort.	Bayard, Fort.	*Concho, Fort.	Sheridan, Camp.
Alcatraz Island.	Pembina, Fort.	Gibson, Fort.	*Montana.*	Selden, Fort.	McIntosh, Fort.	Washakie, Fort.
Benecia Barracks.	Randall, Fort.	Reno, Fort.	Keogh, Fort.	Union, Fort.	Ringgold, Fort.	
	Sisseton, Fort.	Supply, Fort.	*Missoula, Fort.	Wingate, Fort.		

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